

CRITERIA FOR AT-RISK SALMONIDS: NATIONAL FIRE PLAN ACTIVITIES

National Fire Plan Technical Team, April 2003

Purpose: Effects determination criteria were developed to screen National Fire Plan projects for those actions with low-risk to salmonid species in the Northwest, including: sockeye salmon (*Oncorhynchus nerka*), steelhead trout (*O. mykiss*), Chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), chum salmon (*O. keta*), bull trout (*Salvelinus confluentus*), redband trout (*O. mykiss gairdneri*), Lahontan cutthroat (*O. clarki henshawi*), Paiute cutthroat trout (*O. clarki seleniris*), Bonneville cutthroat (*O. clarki utah*), westlope cutthroat (*O. clarki lewisi*), Colorado River cutthroat trout (*O. clarki pleuriticus*), coastal cutthroat (*O. clarki clarki*), and Yellowstone cutthroat (*O. clarki bouvieri*). Both listed and non-listed salmonids, threatened with extinction, or at risk of becoming listed under the Endangered Species Act (ESA) are included and addressed in the criteria as a comprehensive group. These effects

determination criteria are designed to promote consistency across administrative units, assist staff in analyzing potential impacts of projects and developing documentation of effects, guide the development of future projects, and simplify the consultation or conferencing process for projects that meet the effects determination criteria. An “adverse affect” to salmonids was defined by NMFS (1996) as: “.... short or long-term, direct or indirect management-related, impacts of an individual or cumulative nature such as mortality, reduced growth or other adverse physiological changes, harassment of fish, physical disturbance of redds, reduced reproductive success, delayed or premature migration, or other adverse behavioral changes to salmonids at any life stage.” Effects determination criteria developed for non-listed salmonids (redband and cutthroat trout, as well as non-listed chinook, sockeye, steelhead, coho, and bull trout) may be used to promote projects with minimal or beneficial effects to these species, though these species do not require consultation or conferencing. These effects determination criteria may be useful in implementing the agency’s policies for conserving non-listed species (FS 2670 manual, BLM 6840 manual), and for designing actions (projects) that promote species conservation.

I. Criteria development: An interagency team of fisheries biologists (the Salmonids Species Team) was convened in Portland, Oregon on March 12 – 16, 2001 to draft the salmonids criteria. These biologists met with an interagency team of activity experts to develop criteria for potential National Fire Plan projects. After drafting the initial set of criteria, a sub-set of the Salmonids Species Team reviewed and refined the Salmonids Criteria. The criteria were distributed for focused review in July 2001, and the group added subsequent refinements in September 2001, and early 2002, followed by another focused review in March, 2002. We anticipate that the criteria will be continually refined and updated. Future edits will include new criteria and/or clarifications of existing criteria.

The salmonids criteria for ground-disturbing activities within RHCA were, in part, designed to avoid sediment delivery to streams or reduce it to a negligible amount. If

application of the criteria in a local situation does not meet this intent, additional measures to ensure sediment delivery is avoided or negligible may be appropriate and should be developed through the local Level 1 Team or equivalent interagency group.

II. Scientific basis: Salmonids Criteria and Rationale are based in the scientific literature and the consultation experience of the Salmonids and Technical Team members. This effort focused on several key salmonid species in the Northwest. These species were included because: 1). More is known about this group of species than other fishes; 2). They are or were widely distributed; 3). They are predators and competitors and prey on other aquatic taxa and are therefore more likely to influence the status of the entire aquatic ecosystem; and 4). They are potentially more sensitive to disturbance than other aquatic groups (Quigley et al. 1997, p 1146). Several of these species are now listed as “threatened” or “endangered” under ESA in portions of their native ranges in the Northwest. Others are declining in status and at risk of being listed under ESA. The scientific background for the effects of National Fire Plan activities and design measures to ameliorate adverse effects (the criteria) were derived mostly from four major sources:

- 1). **FEMAT** - Forest ecosystem management: an ecological, economic, and social assessment (Forest Ecosystem Management Assessment Team 1993),
- 2). **SCIENCE ASSESSMENT** - An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins (Quigley et al. 1997),
- 3). **INFISH** - Inland Native Fish Strategy (USDA Forest Service 1995), and
- 4). **PACFISH** - Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (USDA Forest Service and USDI Bureau of Land Management 1995).

III. Existing Direction: The criteria for salmonids do not replace existing local direction and requirements. Examples include: PACFISH, INFISH, Lahontan Cutthroat Recovery Plan, Northwest Forest Plan, any biological opinions, and LRMPs/RMPs. All provisions of these documents continue to apply. The provisions of interagency conservation agreements also continue to apply.

IV. Conditional Statements: Criteria were developed for five basic types of conditions (or locations on the landscape), that may or may not be exclusive of one another. Conditional statements were developed geographically for both Watersheds and Riparian Habitat Conservation Areas (RHCAs). “Watersheds” are defined as: 5th Field Hydrologic Unit Code (HUC) for all anadromous salmonids, and 6th Field HUC for all non-anadromous salmonids. RHCAs are defined in PACFISH & INFISH (See Attachment 1). National Fire Plan projects could overlap more than one Conditional Statement.

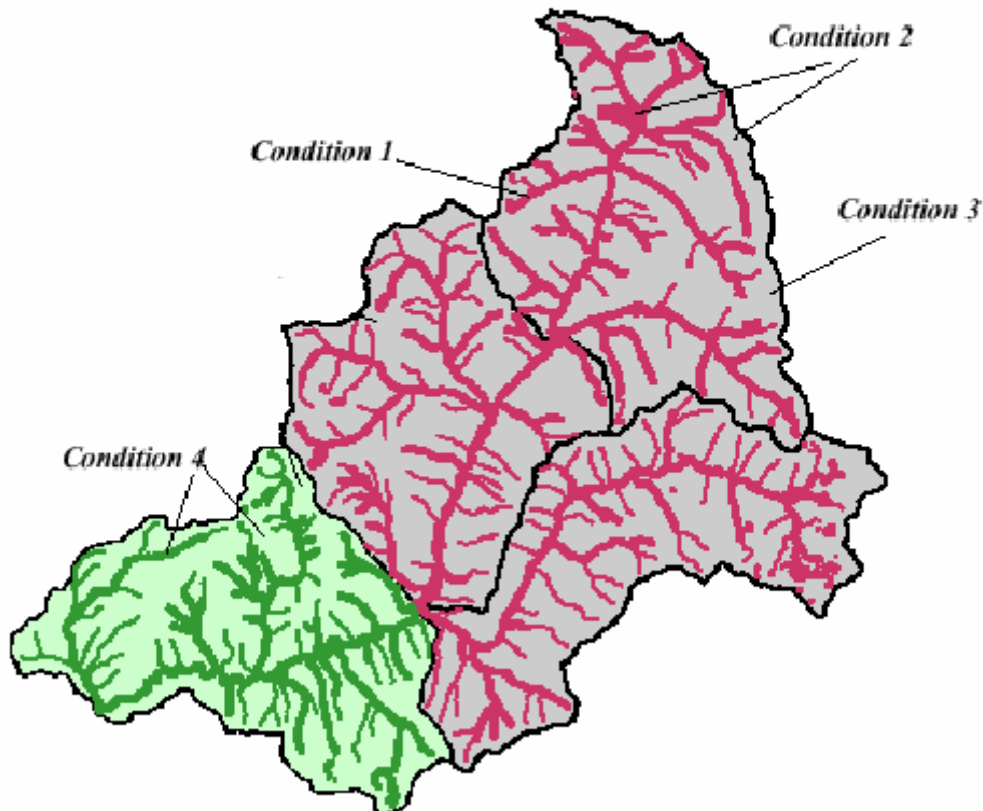
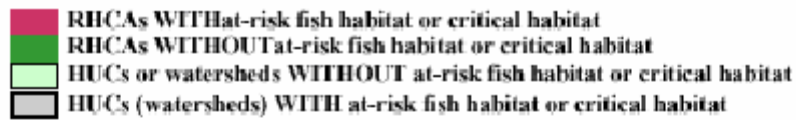
Conditional Statement 1. The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

Conditional Statement 2. The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery, within or outside of RHCAs.

Conditional Statement 3. The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

Conditional Statement 4. The action occurs in watersheds without at-risk fish species or with no designated critical habitat, within or outside of RHCAs. Criteria applied using this condition assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitat.

The following illustrates an application using these “conditions” in a hypothetical basin of multiple 6th Field HUC’s



Condition 1 includes RHCAs within watersheds that are critical to the species.

Condition 2 includes all areas within watersheds that are critical to the species.

Condition 3 includes areas outside of RHCAs within watersheds that are critical to the species.

Condition 4 includes all the area within watersheds that are NOT critical to the species.

A. RHCAs: “RHCA” (Riparian Habitat Conservation Area), as used in the Conditional Statement is defined in PACFISH(1995) and INFISH(1995): It is similar to “riparian reserve” used in the Northwest Forest Plan, and RCA used in the draft ICBEMP EIS.

“Riparian Habitat Conservation Areas are portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. Riparian Habitat Conservation Areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by: 1). Influencing the delivery of coarse sediment, organic matter, and woody debris to streams; 2). Providing root strength for channel stability; 3). Shading the stream,;and 4) protecting water quality" (Naiman et al. 1992).

Further, RHCA extent is described in PACFISH/INFISH as follows:

“Widths of interim Riparian Habitat Conservation Areas that are adequate to protect streams from non-channelized sediment inputs should be sufficient to provide other riparian functions, including delivery of organic matter and woody debris, stream shading, and bank stability" (Brazier and Brown 1973; Gregory et al. 1987; Steinblums et al. 1984; Beschta et al. 1987; McDade et al. 1990; Sedell and Beschta 1991; Belt et al. 1992).

The value and function of riparian vegetation are discussed in The Interior Columbia Basin Science Assessment (Quigley et al. 1997):

“Ecological functions provided by riparian vegetation are achieved at different distances, depending on the type of function and the width of riparian vegetation needed for the function." Examples:

Litter fall and nutrient input and retention in streams (23 to 46 meters), shade to streams for maintenance of summer stream temperatures (23 to 46 meters), woody debris delivery (30 to 46 meters), stream bank stability (23 to 46 meters), and sediment buffering (100 to 170 meters depending on slope and lithology adjacent to the stream).

Watershed or stream-specific analysis should be used as the basis for defining local buffer widths needed to prevent inputs of fine sediment. Based on the Science Assessment, in the absence of local watershed analysis, RHCA buffers adequate to prevent delivery of non-channelized sediment, to both perennial and intermittent streams, should be according to the Table 1 in [Attachment 1](#).

A detailed discussion of riparian management and the scientific basis for RHCA's is contained in Attachment 1. RHCA widths are defined for fish-bearing streams, permanently flowing non-fish bearing streams,

ponds/lakes/reservoirs greater than 1 acre in size, wetlands, intermittent streams, landslides, and landslide-prone areas.

B. Watersheds: The Conditional Statements use two separate watershed (or HUC) scales for anadromous versus inland native fishes. The “Condition” applies if the species occurs (or does not occur) within:

5th Field HUCs for anadromous fishes (chinook, steelhead, coho, chum, and sockeye).

6th Field HUCs for inland native fishes (cutthroat, redband, bull trout).

Local populations of these species are usually more closely associated with the 6th Field scale (US Fish and Wildlife Service 1998). Local anadromous fish populations tend to occur on larger scales (5th Field HUC). Therefore, the Conditional Statement determines whether or not the species of interest, or its critical habitat, or unoccupied habitat critical to its recovery, occurs within the appropriately scaled watershed associated with the proposed National Fire Plan project or activity.

V. Criteria and Rationale: The “effects determination criteria” are defined as: broadly applied, activity-specific stipulations of method, mitigation, and project design, which would lead to a reasonable conclusion that the project is not likely to adversely affect the species or critical habitat, are the centerpiece of this document. The “rationale” or reasons why the criteria would reduce the effect to “Not likely to adversely affect”, or “No effect” were documented for each criteria statement. Scientific background materials for these criteria and rationale are provided in Attachments 1 and 2. When the final effect is stated as “Conserve and Restore”, criteria are given as guidance or recommendations to assist with project effects analysis, but a final determination of effect could not be made at the programmatic level. Expedited consultation would not apply to these “Conserve and Restore” criteria, but they are provided here as possible conservation measures that would benefit at-risk fish and/or their habitats. Attachments summarize the literature on potential effects of various land management activities on the effects pathways. Relevant attachments are referenced in the criteria.

VI. Effects Pathways

The following components were used to evaluate effects of National Fire Plan activities on at-risk salmonids and their habitat.

Habitat Elements Effect Pathway - Includes all “Habitat Element” indicators contained in Table 2, Attachment 3.

Water Yield Effect Pathway – Includes all “Flow/Hydrology” indicators contained in [Table 2, Attachment 3](#).

Water Quality Effect Pathway - Includes all “Water Quality” indicators contained in Table 2, Attachment 3.

Riparian Vegetation Condition Effect Pathway - Condition of riparian vegetation to provide adequate shade, large woody debris recruitment, fine sediment filtration, stream bank protection, and favorable microclimate. Includes ability to adequately buffer impacts of land disturbance on at-risk salmonids and their habitat. Condition is often measured by percent similarity of riparian vegetation to the potential natural community/composition.

VII. Salmonid criteria database: Criteria and rationale were documented in a database using MS - ACCESS. The database was used to handle sorting and queries. Otherwise, the criteria are presented in the following section in .pdf format. Criteria in this document are ordered alphabetically according to Activity Type, Activity Component, and Work Element. Since the document is large, “Bookmarks” are provided for ease of access. Just click on the Bookmarks Tab to activate them. “Links” are also provided, all links are [red](#).

Instructions for use of Effects Determination Criteria

1. Review the proposed action to determine if at-risk fish species may be affected by the proposed action (either they occur or have potential habitat within the project area), and to determine which **Activity Types**, Activity Components, and *Work Elements* apply.
2. Review the criteria for each **Activity Type**/Component/*Work Element*. Consider whether or not the project design is consistent with the criteria.
3. For ground disturbing activities within RHCAs that may have short-term adverse affects with long-term positive effects (i.e. road decommissioning), and that are inconsistent with the criteria, use local design considerations and consult locally.
4. If activity occurs in occupied habitat, review the criteria for appropriate **Activity Type**/Component/*Work Elements*. Fill out the Consultation Worksheet with required information by copying and pasting from the .pdf file to the Worksheet.

CRITERIA FOR SALMONIDS – HOW TO USE THE SYSTEM

1. **Before using the criteria, read the background material above.**
2. Use the bookmarks (at left) to navigate to “**Activity Types**”, “Activity Components”, and “*Work Element*”. Click on the plus sign on the left side of the bookmarks to view components and work elements. All activities are listed alphabetically.
3. Words, sentences, or paragraphs highlighted in **red** text are linked to other portions of the document. Just place the mouse pointer on the highlighted text. When you see the hand with index finger icon appear, click the left mouse button to automatically move to the linked reference. To return to your previous position, use the left-pointed arrow (“go to previous view”) located on the tool bar.
4. Instructions for copying text from .pdf files are contained in the WEB page.

IV. References:

- Belt, G.H., J. O'Laughlin, T. Merrill. 1992. Design of forest riparian buffer strips for the protection of water quality: analysis of scientific literature. Report No. 8. Moscow, ID: University of Idaho, Idaho Forest, Wildlife and Range Policy Analysis Group.
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- Brazier, J.R., G.W. Brown. 1973. Buffer strips for stream temperature control. Research Paper 15. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
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- McDade, M.H., F.J. Swanson, [and others]. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Canadian Journal of Forest Resources 20: 326-330.
- Sedell, J.R., R.L. Beschta. 1991. Bringing back the "bio" in bioengineering. In: Colt, J.; Dendral, S., eds. Fisheries bioengineering: Proceedings of the symposium. Bethesda, MD: American Fisheries Society. 10: 160-175.
- Naiman, R.J., T.J. Beechie, [and others]. 1992. Fundamental elements of ecologically healthy watersheds in the Pacific Northwest coastal ecoregion. In: Naiman, R.J., ed. Watershed management: Balancing sustainability and environmental change. New York: 127-169.
- National Marine Fisheries Service. 1996. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. The National Marine Fisheries Service, Environmental and Technical Services Division, Habitat Conservation Branch.
- Quigley, T.M., S.J. Arbelbide, tech. eds. 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 vol. (Quigley, T.M., tech. ed.; The Interior Columbia Basin Ecosystem Management Project: Scientific Assessment), Volume 3, pp 1365-1369
- U.S. Department of Agriculture (USDA) Forest Service - INFISH (Inland Native Fish Strategy). 1995. Environmental Assessment: Decision Notice and Finding of No Significant Impact. Interim Strategies for managing fish-producing watersheds in eastern Oregon and Washington, Idaho, western Montana and portions of Nevada. [Place of publication unknown]: U.S. Department of Agriculture, Forest Service, Intermountain, Northern, and Pacific Northwest Regions.

US Department of Agriculture (USDA) Forest Service and USDI Bureau of Land Management (PACFISH). 1995. Decision Notice/Decision Record, FONSI, EA, Appendices for the Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California. Washington, DC: U.S. Department of Agriculture, Forest Service; U.S. Department of Interior, Bureau of Land Management.

US Fish and Wildlife Service, 1998. A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale. U.S. Department of the Interior, Fish and Wildlife Service. Boise, ID. 46 pp.

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mine Site/Abandoned Mine Reclamation
Work Element:	All except where otherwise noted
	This Work Element includes: • Restore surface flow / Floodplain reclamation • Mine shaft backfilling • Removal of hazardous waste (Hazmat) • Wetlands reclamation – Remove contaminated soil • Wetlands reclamation – Restore stream channel • Wetlands reclamation – Construct repository • Tailings impoundment rehab – Water management • Tailings impoundment rehab – Cap impoundment • Dredge tailings restoration – Tailings redistribution • Dredge tailings restoration – Restore channel flow • Groundwater control – Reroute Groundwatercontrol – Treat

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of these activities requires site specific information.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mine Site/Abandoned Mine Reclamation
Work Element:	Close mine opeinings, adits, and stopes - gates, foam sealant, backfilling, blasting

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No foam sealant applications, no blasting, and no backfilling within RHCAs. Prevent and minimize erosion from closing mine activities by designing and maintaining proper BMPs.	Foam sealants are potentially toxic to salmonids. Blasting and backfilling has potential for debris/sediment to impact waters. Shock waves from blasting has potential impacts to Salmonids.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No refueling with RHCA Blasting and backfiling will only be allowed in areas where materials (rocks) and or sediment may not potentially reach live waters. Prevent and minimize erosion from closing mine activities by designing and maintaining proper BMPs.	RHCAs are adequate as a buffer to prevent foam sealant applications from adversely affecting (contaminating) streams.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mine Site/Abandoned Mine Reclamation
Work Element:	Dredge tailings restoration - aerial surveys

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	This action is small enough and located where affects would not be expected.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mine Site/Abandoned Mine Reclamation
Work Element:	Groundwater control - test

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No drilling or heavy equipment use within the RHCA.	Sampling and testing is small enough and located where affects would not be expected.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mine Site/Abandoned Mine Reclamation
Work Element:	Mine waste dump removal - Inventory and monitor

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Inventories and analyses have no ground disturbances.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mine Site/Abandoned Mine Reclamation
Work Element:	Mine waste dump removal - test

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No drilling or heavy equipment within the RHCA.	Sampling and testing is small enough and located where affects would not be expected.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mine Site/Abandoned Mine Reclamation
Work Element:	Mine waste dump removal - treat

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria	Consult locally Mine-wastes and related contaminants have the potential to produce serious/severe adverse affects.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria	Risks of contamination/transport to streams are minimal but toxicity of contaminants is great enough to justify local consultation - consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Abandoned Mine Restoration
Activity Component:	Mining Waste Cleanup
Work Element:	All except where otherwise noted
This Work Element includes: • Junk removal • Preliminary Assessments, Inventories, Analyses • Contaminated soil removal Barrel removal • Reclamation plan implementation	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. Mine-wastes and related contaminants have the potential to produce serious/severe adverse affects.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. Risks of contamination/transport to streams are minimal but toxicity of contaminants is great enough to justify local consultation.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Access and Equipment Maintenance
Activity Component:	Access to work site
Work Element:	Access by foot or pack animals

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Sediment and turbidity	Potentially Adverse	<p>Stay on designated trails.</p> <p>Stock handling facilities, camp facilities and improvements will be located at least 300 feet from lakes, streams, and springs.</p> <p>Stock handlers will be educated on at-risk fish including identification, Endangered Species Act, and how to minimize adverse affects to the species and their associated habitat.</p>	<p>Criteria are sufficient to avoid potential adverse affects.</p> <p>Avoids sediment delivery by keeping facilities well away from streams.</p>	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Sediment and turbidity	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Access and Equipment Maintenance
Activity Component:	Access to work site
Work Element:	Access by helicopter/aircraft

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Sediment and turbidity	Potentially Adverse	No landing of helicopters or aircraft within RHCAs. No construction of helicopter pads within RHCAs.	Criteria are sufficient to avoid potential adverse affects. Avoids sediment delivery (see Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Sediment and turbidity	No Effect	No fueling within RHCAs. No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Access and Equipment Maintenance
Activity Component:	Access to work site
Work Element:	Access by vehicle on roads, within normal use patterns

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Sediment and turbidity	Potentially Adverse	Access is only allowed on existing open roads. Travel must cease when damage to the road surface will result or is occurring. No ground disturbances during spawning and incubation periods.	Criteria are sufficient to avoid potential adverse effects. Avoids sediment delivery.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Sediment and turbidity	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Access and Equipment Maintenance
Activity Component:	Access to work site
Work Element:	Access by vehicle or ATV off roads or outside of normal use patterns

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Sediment and turbidity	Potentially Adverse	Off-road activities by vehicle or ATV are not allowed within RHCA. Outside the RHCA, activities will only be conducted on slopes of 20% or less. (see Attachment 1 - Riparian Area (RHCA) Literature Summary). No fueling of machines within RHCA's	Criteria are sufficient to avoid potential adverse affects. Avoids sediment delivery (see Attachment 1) and fuel delivery (see Attachment 2).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Sediment and turbidity	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Access and Equipment Maintenance
Activity Component:	Fueling/Maintenance
Work Element:	All except where otherwise noted
This Work Element includes: • Fueling/Maintenance of small equipment on site • Fueling/Maintenance of heavy equipment on site	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of these activities requires site specific knowledge.	Potentially Adverse
Action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	All helicopter fueling operations require an approved transportation, storage, and emergency spill plan. Other heavy equipment fueling operations will consist of a slip-tank not greater than 250 gallons. Maintenance operations must have spill containment and cleanup provisions. Apply PACFISH/INFISH Standard and Guideline RA-4 (fuel storage within RHCAs) for activities outside the RHCA.	Criteria are sufficient to avoid potential adverse effects.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect	Water quality, take, channel morphology and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Defensible Space
Activity Component:	Fuels reduction
Work Element:	Remove plants or plant parts

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design. This is anticipated to be an infrequent action requiring formal consultation.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Removal of plant materials could have an adverse affect on the attainment of RMOs. The small scale (30 to 120 feet surrounding a facility), limits the potential for adverse affects.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Defensible Space
Activity Component:	Fuels reduction
Work Element:	Replace flammable plants with less flammable plants

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>No plant removal within RHCA.</p> <p>No removal of riparian vegetation.</p> <p>Where possible, replant using native species.</p> <p>For water withdrawal: No instream alteration of substrate. Water withdrawal via hose pipes (less than 1" diameter) will not reduce stream flow from the original wetted width.</p> <p>Screen pump or hose intake. Drafting of water for will be restricted to an area identified by a fishery biologist and/or hydrologist to prevent the potential for "take".</p> <p>For plant removal, SEE: Defensible Space Activity Type, Fuels Reduction Activity Component, Remove Plants Work Element.</p>	<p>Planting and watering vegetation would not adversely affect at risk fish. Riparian plant species are resistant to fire. As native species are replaced by exotic plants, alterations in habitat can result from reduced streambank protection, loss of undercut bank cover, loss of overhanging vegetation cover, reduced pool depth and volume, increased erosion and fine sediment deposition on the substrate, increased stream width and thermal relationships, and decreased detrital and nutrient inputs to the stream (see Attachment 4).</p> <p>Screening of pump intake will prevent juvenile entrainment.</p>	Not Likely to Adversely Affect
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Do not replace riparian plant species. Where possible, use native species within RHCAs.</p> <p>No instream alteration of substrate. Water withdrawal via hose pipes will not reduce stream flow from the original wetted width. Screen pump</p>	<p>Planting and watering vegetation would not adversely affect at risk fish. Riparian plant species are resistant to fire. As native species are replaced by exotic plants, alterations in habitat can result from reduced</p>	Not Likely to Adversely Affect

			or hose intake. Drafting of water for will be restricted to an area identified by a fishery biologist and/or hydrologist to prevent "take".	streambank protection, loss of undercut bank cover, loss of overhanging vegetation cover, reduced pool depth and volume, increased erosion and fine sediment deposition on the substrate, increased stream width and thermal relationships, and decreased detrital and nutrient inputs to the stream (see Attachment 4).	
			For plant removal, SEE: Defensible Space Activity Type, Fuels Reduction Component, Remove Plants Work Element.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	Screening of pump intake will prevent juvenile entrainment. No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Defensible Space
Activity Component:	Structure modifications
Work Element:	All except where otherwise noted
This Work Element includes: • Replace flammable roof materials • Remove ignitable materials surrounding structures	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Removing flammable and ignitable products does not pose a risk to salmonids or habitat.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Forest Products
Activity Component:	All except where otherwise noted
Work Element:	All except where otherwise noted
This Work Element includes all Work Elements within the following Activity Components:• Fruits, berries and nut harvest • Greenery harvest – total removal • Moss harvesting • Mushroom harvesting • Seed collection	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No camping within RHCAs. For Access: SEE - Access and Equipment Maintenance Activity Type, Access to Work Sites Activity Component.	The scale of this activity small enough to avoid potential adverse affects, with the exceptiong of camping and access.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Scale of activity is small enough to have no potential adverse affects.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Forest Products
Activity Component:	Firewood collection
Work Element:	Collect firewood from already downed sources (e.g. hazard tree removal, road maintenance, etc.)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No firewood cutting within the RHCA. SEE: Mechanical Treatment Activity Type; Harvest Prescription/Implementation Activity Component; Dead Trees; Salvage and Hazard Tree Removal Work Element	Criteria are sufficient to avoid potential adverse effects. Prevents disturbances that potentially impact LWD recruitment, erosion/sedimentation, and root strength/bank stability.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse effect to at-risk fish species. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Forest Products
Activity Component:	Tree and Shrub Removal
Work Element:	Complete or partial removal of trees or shrubs

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Criteria for these activities cannot be developed at this scale because of the complexity.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not exceed an Equivalent Clearcut Area (ECA) of 15% (NMFS 1995 LRMP BO).	Consult locally. These activities do not pose the potential for adverse affect to at-risk fish species, because the RHCA is adequate to buffer effects from ground disturbances associated with the activity.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Aerial survey and application of insecticides and pesticides
Work Element:	All except where otherwise noted
This Work Element includes: • Fixed wing/helicopter flights and application below 1500 foot altitude • Fixed wing/helicopter flights and application above 1500 foot altitude	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	The complexity of this action within RHCAs requires local consultation. Only Aerial surveys are allowed.	Consult locally. For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, and may be mediated by site specific landscape and climatic conditions.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	The complexity of this action requires local consultation. Only Aerial surveys are allowed.	Consult locally. For programmatic application of this action, the complexity of the activity requires extreme precautions, and may be mediated by site specific landscape and climatic conditions.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No Criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Fertilization
Work Element:	Hand application of N frells

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Chemical contaminants and nutrients	Potentially Adverse	When PACFISH/INFISH standards & guidelines RA3 and RA4 are met, then add the following: do not apply within 25 feet of streams and supersaturated soils. Apply by following labeling instructions.	Implementing this criteria avoids adverse affects to fish by preventing application into water. This is not a ground disturbing activity and therefore not require a sediment buffer.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Chemical contaminants and nutrients	No Effect	No criteria.	Hand application outside the RHCA will not result in delivery of fertilizer to the stream.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Chemical contaminants and nutrients	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Ground application of pesticides
Work Element:	All except where otherwise noted
This Work Element includes: • Backpack spraying or inoculation of individual trees with insecticide • Borax treatment of freshly cut stumps	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The range of conditions and chemical compounds requires site-specific analysis.	Potentially Adverse
The action occurs outside the RHCA in watersheds with listed fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The range of conditions and chemical compounds requires site-specific analysis. Until such time as the risk assessments and fate and transport models are available, broad criteria cannot be provided.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Ground Survey
Work Element:	Walking survey

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	The scale of this activity is small enough to have no potential adverse affects.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids				
Activity Type:	Insect and Disease Suppression				
Activity Component:	Manual Treatments				
Work Element:	All except where otherwise noted				
	This Work Element includes:• Thin, selecting against species/conditions • Burning infested tree • Topping or otherwise killing and removing infested trees • Slash disposal, lop and scatter, pile or cover hand pile and burn • Pruning				
<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>

For mechanical removal of infested trees SEE: Activity Type - Mechanical Treatments; Activity Component - Harvest Prescription/Implementation; Work Element - Dead trees: salvage and hazard tree removal; thinning understory/single story treatments.

For burning SEE: Activity Type - Prescribed Fire; Activity Components - all vegetation types; Work Element - burning piles

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Mechanical Treatments
Work Element:	Harvest/removal of fire-damaged or other high-risk trees

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	Consult locally on these activities: regeneration harvest, clearcutting, seed tree harvest, shelterwood, overstory removal, partial overstory removal, sanitation, or selection harvest.	Criteria for these activities cannot be developed at this scale because of the complexity.	Potentially Adverse
			See Silvicultural Considerations in Attachment 1 - RHCA Silvicultural Management Options.		
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not exceed an Equivalent Clearcut Area (ECA) of 15% (NMFS 1995 LRMP BO).	Harvest activities will not alter the timing, magnitude duration, and spatial distribution of peak, high, and low flows.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Mechanical Treatments
Work Element:	Slash disposal debark/chip/or fragment, machine pile and burn

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Treatment will be conducted to avoid adverse affects to streambanks and riparian vegetation and affects to streamside shade.</p> <p>Treatment will occur at least one site-potential tree height from the active channel or 100 feet (whichever is greater);(See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>Hand piling or lopping and scattering only, one site potential tree height away from the active channel, and covering no more than 10 percent of the RHCA within the action area.</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment.</p>	Criteria are sufficient to avoid potential adverse affects by filtering sediment produced by the disturbance (see Attachment 2).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Dozer piling on slopes < or equal to 40% will be limited to:</p> <ul style="list-style-type: none"> ·Excavator; ·Rubber-tire skidder with grapple; ·Low soil compacting /ground disturbing equipment. <p>Piling on slopes >40% will be limited to:</p> <ul style="list-style-type: none"> ·Hand pile only. 	<p>Activities associated with piling using these criteria, will reduce potential for sediment to reach streams. The RHCA acts as an adequate buffer.</p> <p>See Attachment 1, Figure 4.26.</p>	Not Likely to Adversely Affect
The action occurs in watersheds	Water quality and	No Effect	No criteria.	No at risk salmonids and/or	No Effect

without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

habitat elements

habitat present.

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Mechanical Treatments
Work Element:	Young stand destruction, chaining, roller chopping

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Riparian veg. condition, temperature, large woody debris, water yield and sediment yield.	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site-specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	For water drafting (SEE: Activity Type - Prescribed Fire; Activity Component - Water Drafting). Riparian veg. condition, temperature, large woody debris, water yield and sediment yield	Potentially Adverse	No on-site draining of antifreeze from roller drums used for roller-chopping.	These activities do not pose the potential for adverse affect to at-risk fish species because the RHCA is large enough to prevent adverse affects of erosion/sedimentation. Changes in flow regime would not result from the loss of young stands which have minimal or no influence on site hydrology/evapotranspiration.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	Riparian veg. condition, temperature, large woody debris, water yield, and sediment yield.	No Effect	No criteria	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Population Assessment and Trapping
Work Element:	Sampling and trapping

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	The scale of this activity is small enough to have no potential adverse affects.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Use of Fire
Work Element:	Pulling back duff from legacy trees

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Using rakes and shovels would create little or no disturbance.	No Effect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Insect and Disease Suppression
Activity Component:	Use of Pheromones
Work Element:	All except where otherwise noted
This Work Element includes:• Anti-aggregate bubble caps • Trap tree baiting and removal	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Use of insect pheromones will have no effect on Salmonids or their habitats.	No Effect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Dust Abatement
Work Element:	Water drafting

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Drafting of water for dust abatement and road compacting will be restricted to an area identified by a fishery biologist and/or hydrologist to prevent "take".</p> <p>Any draft suction hose used will be equipped with a screen of 3/32 inch mesh or less and will have an intake flow of less than 1 foot/second to prevent entraining juvenile fish.</p> <p>Also SEE Prescribed Fire Activity Type; Fireline Construction/Holding Actions Activity Component; Drafting to fill engines/tenders Work Element.</p>	<p>Applies National Marine Fisheries Service criteria for entrainment avoidance.</p> <p>These criteria were derived from previous programatic consultations (Salmonid Species Team). They were designed to avoid adverse affects to the pathway elements. There will be a negligible risk of incidental take caused by pump entrainment or screen impingement. Water drafting/pumping will maintain a continuous surface flow of the stream, without altering the original wetted width.</p>	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Harvest Prescription/Implementation
Work Element:	All except where otherwise noted
This Work Element includes: • Regeneration harvest: clearcut, seed tree, shelterwood • Overstory treatments: overstory removal, partial overstory removal, sanitation • Selection - all stand layers	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	Consult locally on these activities: regeneration harvest, clearcutting, seed tree harvest, shelterwood, overstory removal, partial overstory removal, sanitation, or selection harvest. See Silvicultural Considerations in Attachment 1 - RHCA Silvicultural Management Options.	Criteria for these activities cannot be developed at this scale because of the complexity. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not exceed an Equivalent Clearcut Area (ECA) of 15% (NMFS 1995 LRMP BO).	Harvest activities will not alter the timing, magnitude duration, and spatial distribution of peak, high, and low flows.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Harvest Prescription/Implementation
Work Element:	Dead trees: salvage, hazard tree removal

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>No felled trees within 25 feet of the edge of the bankfull channel, or .3 site-potential tree height, whichever is greater, (Attachment 1).</p> <p>Felled trees will not be removed from the RHCA (See Attachments 1 and 2).</p> <p>Directionally fell trees towards the stream and retain fallen trees on site.</p> <p>Follow PACFISH/INFISH Standard and Guideline RA-2 for reference to hazard tree removal.</p> <p>FOR SALVAGE: No salvage activities within the RHCA.</p>	Leaving felled trees retains nutrients and potential LWD; other actions avoid erosion and sediment delivery.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Do not exceed an Equivalent Clearcut Area (ECA) of 15% (NMFS 1995 LRMP BO).</p> <p>No skid trails and/or landings located where erosion/sedimentation would intercept road drainage ditches.</p>	Criteria avoids sediment delivery from skid trails and landings - RHCA buffer plus disconnection from road-related flow paths.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Harvest Prescription/Implementation
Work Element:	Understory/single story treatments: thinning

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	<p>No thinning, except: thinning in RHCAs will be only where present and future woody debris needs are met, and where harvest will not prevent attainment of RMOs, and adverse affects to at-risk fish can be avoided (PACFISH/INFISH TM1a).</p> <p>The requirement to complete a watershed analysis for this activity shall include key questions relevant to achieving RMOs and acquiring required vegetation characteristics within the RHCA.</p> <p>Apply silvicultural practices to acquire desired characteristics needed to attain RMOs (PACFISH/INFISH TM1b).</p> <p>To achieve shade and woody debris needs, thinning should not be allowed within 1 site-potential tree height of the stream channel (Attachment 1).</p> <p>No skidding and no landings within the RHCA.</p> <p>SLASH: Hand piling or lopping and scattering only, one site potential tree height away from the</p>	These criteria were derived from previous programatic consultations. They were designed to avoid adverse affects to the pathway elements.	Not Likely to Adversely Affect

active channel.

All fueling and fuel storage areas as well as service landings will be located outside the RHCA.

See Silvicultural Considerations in [Attachment 1 - RHCA Silvicultural Management Options](#).

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not exceed an Equivalent Clearcut Area (ECA) of 15% (NMFS 1995 LRMP BO).	Harvest activities will not alter the timing, magnitude duration, and spatial distribution of peak, high, and low flows.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Killing submerchantable trees
Work Element:	All except where otherwise noted

This Work Element includes ALL activities within this Activity Component

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	<p>No thinning, except: thinning in RHCAs will be only where present and future woody debris needs are met, and where harvest will not prevent attainment of RMOs, and adverse affects to at-risk fish can be avoided (PACFISH/INFISH TM1a). The requirement to complete a watershed analysis for this activity shall include key questions relevant to achieving RMOs and acquiring required vegetation characteristics within the RHCA.</p> <p>Apply silvicultural practices to acquire desired characteristics needed to attain RMOs (PACFISH/INFISH TM1b).</p> <p>To achieve shade and woody debris needs, thinning should not be allowed within 1 site-potential tree height of the stream channel (Attachment 1).</p> <p>No skidding and no landings within the RHCA.</p> <p>SLASH: Hand piling or lopping and scattering only, one site potential tree height away from the</p>	These criteria were derived from previous programatic consultations. They were designed to avoid adverse affects to the pathway elements.	Not Likely to Adversely Affect

			active channel.		
			All fueling and fuel storage areas as well as service landings will be located outside the RHCA.		
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not exceed an Equivalent Clearcut Area (ECA) of 15% (NMFS 1995 LRMP BO).	Harvest activities will not alter the timing, magnitude duration, and spatial distribution of peak, high, and low flows.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Logging Systems and Operations
Work Element:	All except where otherwise noted
This Work Element includes: • Ground based logging • Helicopter • High Lead • Skyline • Hauling • Loading • Landing construction and location	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria	The complexity of these activities requires site specific knowledge. Consult locally.	Potentially Adverse
The action occurs outside of RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Skidding trails will not be located on slopes exceeding 40%. No skid trails perpendicular to the RHCA within 500'.</p> <p>No skid trails or landings on unstable slopes. Avoid sediment routing from skid trails and landings into streams.</p> <p>No sediment routing from skid trails and landings into streams.</p> <p>Prevent sediment production and delivery to streams by using standard erosion and sediment control measures.</p> <p>No log hauling during wet weather on non-paved roads.</p>	The RHCA is adequate as a buffer for potential sediment delivery associated with the activity (see Attachments 1 and 2).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	Water quality and habitat elements	No Effect	No criteria	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Reducing Soil Compaction
Work Element:	Subsoiling

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Ensure that PACFISH/INFISH standards & guidelines RM1 through RM3 are met.</p> <p>Avoid ground disturbances during spawning and incubation periods, then add the following: Avoid applying this action within 25' away from the bankful channel or .3 site potential tree height (whichever is greater).</p> <p>Avoid erosion (e.g. ripping on steep slopes) and transport that have the potential to deliver sediment to the stream (i.e. use silt fences). Use the following buffers:</p> <p><5% slope, 115 ft. buffer 6% - 10% slope, 165 ft. buffer 11% - 15% slope, 210 ft. buffer 16% - 20% slope, 250 ft. buffer 21% - 25% slope, 300 ft. buffer 26% - 30% slope, 325 ft. buffer 31% - 40% slope, 350 ft. buffer 41% - 50% slope, 400 ft. buffer 51% - 60% slope, 430 ft. buffer >60% slope, 450 ft. buffer</p> <p>Use ripping and re-contouring only if it would lessen the existing erodability.</p>	Criteria will prevent significant sediment input into the stream, and potential adverse affects on rooting strength so important to bank stability.	Not Likely to Adversely Affect

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	For mulching, SEE: Watershed Restoration Activity Type; Revegetation Activity Component; Mulch application Work Element. Dozer subsoiling will only be conducted on slopes of 20% or less.	Activity outside the RHCA on gentle slopes does not pose the potential for adverse effect to at-risk fish species by restricting potential erosion and sediment delivery (Attachment 1, Figure 4.26). No at risk salmonids and/or habitat present.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.		No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Rehabilitation, removal of excess vegetation and slash
Work Element:	All except where otherwise noted
This Work Element includes:• Furrowing • Patch scarification, mechanically or by hand • Dozer scarification • Dozer piling • Grapple piling • Hand piling • Piling at landings	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Treatment will be conducted to avoid adverse affects to streambanks and riparian vegetation and affects to streamside shade.</p> <p>Treatment will occur at least one site-potential tree height from the active channel or 100 feet (whichever is greater);(See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>Hand piling or lopping and scattering only, one site potential tree height away from the active channel, and covering no more than 10 percent of the RHCA within the action area.</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment.</p>	Criteria are sufficient to avoid potential adverse affects by filtering sediment produced by the disturbance (see Attachment 2).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Dozer piling on slopes < or equal to 40% will be limited to:</p> <ul style="list-style-type: none"> ·Excavator; ·Rubber-tire skidder with grapple; ·Low soil compacting /ground disturbing equipment. <p>Piling on slopes >40% will be limited to:</p> <ul style="list-style-type: none"> ·Hand pile only. 	<p>Activities associated with piling using these criteria, will reduce potential for sediment to reach streams. The RHCA acts as an adequate buffer.</p> <p>See Attachment 1, Figure 4.26.</p>	Not Likely to Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Water quality and habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Skid Trail/Landing Rehab
Work Element:	Water bars

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	WATER BARRING or installing drain dips is allowed only within spacing specifications from the edges of the stream channel as prescribed by the Riparian Road Guide (1994) in Attachment 7 (page 11) .	Water barring reduces sediment delivery potential if applied as per the criteria (Riparian Road Guide 1994).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Waterbars are intended to improve road surface drainage. RHCAs are adequate to buffer any associated sediment production.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Mechanical Treatments
Activity Component:	Tree Felling
Work Element:	All except where otherwise noted
This Work Element includes: • Hand • Mechanical	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No felled trees within 25 feet of the edge of the bankfull channel, or .3 site-potential tree height, whichever is greater, (Attachment 1). Felled trees will not be removed from the RHCA (See Attachments 1 and 2). Directionally fell trees towards the stream and retain fallen trees on site. Follow PACFISH/INFISH Standard and Guideline RA-2 for reference to hazard tree removal.	Leaving felled trees retains nutrients and potential LWD; other actions avoid erosion and sediment delivery.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not exceed an Equivalent Clearcut Area (ECA) of 15% (NMFS 1995 LRMP BO).	Harvest activities will not alter the timing, magnitude duration, and spatial distribution of peak, high, and low flows.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Aspen, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	Killing above-ground aspen by burning would have an adverse short-term effect on shade, temperature, and nutrient input to the stream. See Attachment 13 for information on effects of fire to aspen.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 25% in the watershed. An ECA limitation of 15% will be applied within the range of listed anadromous salmonids addressed within the 1995 & 1998 Biological opinions for Snake and Upper Columbia Rivers Chinook & Steelhead Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of	RHCA widths are adequate to buffer the stream (based on Attachment #1). The amount of area expected to be treated is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For fencing, SEE: Range Infrastructure Activity Type; [Fence Construction/Reconstruction](#) Activity Component.

For aspen restoration, SEE Threatened & Endangered Species Habitat Restoration Activity Type; [Aspen Restoration Activity Component](#)

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present..

No Effect

at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment, sediment, water quality, habitat elements, water yield	<p>Treat aspen stands in riparian areas to achieve desired vegetation characteristics that have the following beneficial effects (both long and short term):</p> <ol style="list-style-type: none"> 1. Increases potential shade long-term; 2. Increases LWD recruitment short-term; 3. Increases pool frequency short-term; 4. Increases width/depth ratio long-term; 5. Improves sediment regime long-term; 6. Improves stream flow regime long-term; 7. Increases nutrient input long-term. <p>See Attachment 13 for information on effects of fire on aspen.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The INFISH/PACFISH goals emphasize diverse and productive riparian vegetation characteristic of natural ecosystems, or characteristic of conditions under which the riparian communities developed. Therefore prescribed fires should be designed to move natural, seral aspen communities, from their present condition dominated by conifers and shrubs, back to their historic natural condition of even-aged stands reflective of fire disturbance regimes under which they developed.</p> <p>See Attachment 13 for information on the beneficial effects of treating aspen stands.</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Aspen, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	Killing above-ground aspen by burning would have an adverse short-term effect on shade, temperature, and nutrient input to the stream. See Attachment 13 for information on effects of fire to aspen.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 25% in the watershed. An ECA limitation of 15% will be applied within the range of listed anadromous salmonids addressed within the 1995 & 1998 Biological opinions for Snake and Upper Columbia Rivers Chinook & Steelhead Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of	RHCA widths are adequate to buffer the stream (based on Attachment #1). The amount of area expected to be treated is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For fencing, SEE: Range Infrastructure Activity Type; [Fence Construction/Reconstruction](#) Activity Component.

For aspen restoration, SEE Threatened & Endangered Species Habitat Restoration Activity Type; [Aspen Restoration Activity](#) Component

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment, sediment, water quality, habitat elements, water yield	<p>Treat aspen stands in riparian areas to achieve desired vegetation characteristics that have the following beneficial effects (both long and short term):</p> <ol style="list-style-type: none"> 1. Increases potential shade long-term; 2. Increases LWD recruitment short-term; 3. Increases pool frequency short-term; 4. Increases width/depth ratio long-term; 5. Improves sediment regime long-term; 6. Improves stream flow regime long-term; 7. Increases nutrient input long-term. <p>See Attachment 13 for information on effects of fire on aspen.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The INFISH/PACFISH goals emphasize diverse and productive riparian vegetation characteristic of natural ecosystems, or characteristic of conditions under which the riparian communities developed. Therefore prescribed fires should be designed to move natural, seral aspen communities, from their present condition dominated by conifers and shrubs, back to their historic natural condition of even-aged stands reflective of fire disturbance regimes under which they developed.</p> <p>See Attachment 13 for information on the beneficial effects of treating aspen stands.</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Aspen, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	Killing above-ground aspen by burning would have an adverse short-term effect on shade, temperature, and nutrient input to the stream. See Attachment 13 for information on effects of fire to aspen.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 25% in the watershed. An ECA limitation of 15% will be applied within the range of listed anadromous salmonids addressed within the 1995 & 1998 Biological opinions for Snake and Upper Columbia Rivers Chinook & Steelhead Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of	RHCA widths are adequate to buffer the stream (based on Attachment #1). The amount of area expected to be treated is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For fencing, SEE: Range Infrastructure Activity Type; [Fence Construction/Reconstruction](#) Activity Component.

For aspen restoration, SEE Threatened & Endangered Species Habitat Restoration Activity Type; [Aspen Restoration Activity](#) Component

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment, sediment, water quality, habitat elements, water yield	<p>Treat aspen stands in riparian areas to achieve desired vegetation characteristics that have the following beneficial effects (both long and short term):</p> <ol style="list-style-type: none"> 1. Increases potential shade long-term; 2. Increases LWD recruitment short-term; 3. Increases pool frequency short-term; 4. Increases width/depth ratio long-term; 5. Improves sediment regime long-term; 6. Improves stream flow regime long-term; 7. Increases nutrient input long-term. <p>See Attachment 13 for information on effects of fire on aspen.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The INFISH/PACFISH goals emphasize diverse and productive riparian vegetation characteristic of natural ecosystems, or characteristic of conditions under which the riparian communities developed. Therefore prescribed fires should be designed to move natural, seral aspen communities, from their present condition dominated by conifers and shrubs, back to their historic natural condition of even-aged stands reflective of fire disturbance regimes under which they developed.</p> <p>See Attachment 13 for information on the beneficial effects of treating aspen stands.</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Aspen, Fire Regime III
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	Killing above-ground aspen by burning would have an adverse short-term effect on shade, temperature, and nutrient input to the stream. See Attachment 13 for information on effects of fire to aspen.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 25% in the watershed. An ECA limitation of 15% will be applied within the range of listed anadromous salmonids addressed within the 1995 & 1998 Biological opinions for Snake and Upper Columbia Rivers Chinook & Steelhead Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of	RHCA widths are adequate to buffer the stream (based on Attachment #1). The amount of area expected to be treated is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For fencing, SEE: Range Infrastructure Activity Type; [Fence Construction/Reconstruction](#) Activity Component.

For aspen restoration, SEE Threatened & Endangered Species Habitat Restoration Activity Type; Aspen Restoration Activity Component

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

elements

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment, sediment, water quality, habitat elements, water yield	<p>Treat aspen stands in riparian areas to achieve desired vegetation characteristics that have the following beneficial effects (both long and short term):</p> <ol style="list-style-type: none"> 1. Increases potential shade long-term; 2. Increases LWD recruitment short-term; 3. Increases pool frequency short-term; 4. Increases width/depth ratio long-term; 5. Improves sediment regime long-term; 6. Improves stream flow regime long-term; 7. Increases nutrient input long-term. <p>See Attachment 13 for information on effects of fire on aspen.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The INFISH/PACFISH goals emphasize diverse and productive riparian vegetation characteristic of natural ecosystems, or characteristic of conditions under which the riparian communities developed. Therefore prescribed fires should be designed to move natural, seral aspen communities, from their present condition dominated by conifers and shrubs, back to their historic natural condition of even-aged stands reflective of fire disturbance regimes under which they developed.</p> <p>See Attachment 13 for information on the beneficial effects of treating aspen stands.</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Aspen, Fire Regime III
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	Killing above-ground aspen by burning would have an adverse short-term effect on shade, temperature, and nutrient input to the stream. See Attachment 13 for information on effects of fire to aspen.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 25% in the watershed. An ECA limitation of 15% will be applied within the range of listed anadromous salmonids addressed within the 1995 & 1998 Biological opinions for Snake and Upper Columbia Rivers Chinook & Steelhead Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For fencing, SEE: Range Infrastructure Activity Type; [Fence Construction/Reconstruction](#) Activity Component.

For aspen restoration, SEE Threatened & Endangered Species Habitat Restoration Activity Type; [Aspen Restoration Activity](#) Component

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

elements

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment, sediment, water quality, habitat elements, water yield	<p>Treat aspen stands in riparian areas to achieve desired vegetation characteristics that have the following beneficial effects (both long and short term):</p> <ol style="list-style-type: none"> 1. Increases potential shade long-term; 2. Increases LWD recruitment short-term; 3. Increases pool frequency short-term; 4. Increases width/depth ratio long-term; 5. Improves sediment regime long-term; 6. Improves stream flow regime long-term; 7. Increases nutrient input long-term. <p>See Attachment 13 for information on effects of fire on aspen.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The INFISH/PACFISH goals emphasize diverse and productive riparian vegetation characteristic of natural ecosystems, or characteristic of conditions under which the riparian communities developed. Therefore prescribed fires should be designed to move natural, seral aspen communities, from their present condition dominated by conifers and shrubs, back to their historic natural condition of even-aged stands reflective of fire disturbance regimes under which they developed.</p> <p>See Attachment 13 for information on the beneficial effects of treating aspen stands.</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Aspen, Fire Regime III
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	Killing above-ground aspen by burning would have an adverse short-term effect on shade, temperature, and nutrient input to the stream. See Attachment 13 for information on effects of fire to aspen.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 25% in the watershed. An ECA limitation of 15% will be applied within the range of listed anadromous salmonids addressed within the 1995 & 1998 Biological opinions for Snake and Upper Columbia Rivers Chinook & Steelhead Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For fencing, SEE: Range Infrastructure Activity Type; [Fence Construction/Reconstruction](#) Activity Component.

For aspen restoration, SEE Threatened & Endangered Species Habitat Restoration Activity Type; [Aspen Restoration Activity](#) Component

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with	sediment, water quality, habitat	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

elements

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment, sediment, water quality, habitat elements, water yield	<p>Treat aspen stands in riparian areas to achieve desired vegetation characteristics that have the following beneficial effects (both long and short term):</p> <ol style="list-style-type: none"> 1. Increases potential shade long-term; 2. Increases LWD recruitment short-term; 3. Increases pool frequency short-term; 4. Increases width/depth ratio long-term; 5. Improves sediment regime long-term; 6. Improves stream flow regime long-term; 7. Increases nutrient input long-term. <p>See Attachment 13 for information on effects of fire on aspen.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The INFISH/PACFISH goals emphasize diverse and productive riparian vegetation characteristic of natural ecosystems, or characteristic of conditions under which the riparian communities developed. Therefore prescribed fires should be designed to move natural, seral aspen communities, from their present condition dominated by conifers and shrubs, back to their historic natural condition of even-aged stands reflective of fire disturbance regimes under which they developed.</p> <p>See Attachment 13 for information on the beneficial effects of treating aspen stands.</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large Woody debris to a level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area.</p> <p>6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided.</p>	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

- Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

RMOs:

- Pool frequency
- Water temperature
- Large woody debris
- Bank stability
- Lower bank angle
- Width/depth ratio
- Surface fine sediment
- Cobble embeddedness

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality (ash)	Potentially Adverse	<p>No burning unless native perennial plants are adequately present to respond. Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See Attachment 12, page 5.</p>	<p>Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.</p> <p>Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided.</p>	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

- Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large Woody debris to a level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area.</p> <p>6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided.</p>	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

- Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Brushbeating/mow, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Brushbeating/mow, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Brushbeating/mow, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Herbicide (Spike), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Herbicide (Spike), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Basin big sagebrush, Fire Regime III
Work Element:	Herbicide (Spike), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12](#), page 5, for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)). Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12](#), page 5, for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)). Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

[Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect
			Overstory mortality shall not cause the ECA to exceed 15% in the watershed.		
			Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.		
			Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.		
			Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.		
			Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can		

withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect
			Overstory mortality shall not cause the ECA to exceed 15% in the watershed.		
			Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.		
			Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.		
			Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.		
			Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can		

withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on Attachment 1).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements, water
yield

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regime III
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams.

In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the sediment, water Potentially Adverse Overstory mortality shall not cause RHCA widths are adequate to Not Likely To

RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	quality, habitat elements, water yield		the ECA to exceed 15% in the watershed.	buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Adversely Affect
			Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.		
			Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.		
			Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.		
			Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds	sediment, water	No Effect	No criteria.	No at risk salmonids and/or	No Effect

without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	quality, habitat elements	habitat present.
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>No more than 5% of the treated acres within the RHCA will be burned.</p> <p>No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.</p> <p>Pile burning will cover no more than 5% of the RHCA within the project area.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated

sediment, water quality, habitat elements, water

Potentially Adverse

No more than 5% mortality of overstory trees.

RHCA widths are adequate to buffer the stream (based on [Attachment 1](#)).

Not Likely To Adversely Affect

critical habitat or unoccupied habitat yield
critical to species recovery.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>No Effect</p>	<p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component. No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>No more than 5% of the treated acres within the RHCA will be burned.</p> <p>No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.</p> <p>Pile burning will cover no more than 5% of the RHCA within the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated

sediment, water quality, habitat elements, water

Potentially Adverse

No more than 5% mortality of overstory trees.

RHCA widths are adequate to buffer the stream (based on Attachment #1).

Not Likely To Adversely Affect

critical habitat or unoccupied habitat yield
critical to species recovery.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years. For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>No Effect</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)). Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the sediment, water Potentially Adverse Overstory mortality shall not cause RHCA widths are adequate to Not Likely To

RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	quality, habitat elements, water yield		<p>the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that project contributes toward attainment, or progress towards attainment of appropriate RMOs and is consistent with appropriate biological opinions.</p> <p>Ensure that project does not retard attainment of "properly functioning" condition of relevant indicators (as described within NMFS and FWS matrices of pathways and indicators).</p> <p>Completed matrices will be attached to the completed biological analysis.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to	sediment, water quality, habitat elements	No Effect	No criteria.	No at-risk species present.	No Effect

species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

[Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
			<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p>		
			<p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p>		
			<p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p>		
			<p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p>		
			<p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>		
			<p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>		

withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA.

Area [RHCA] Literature
Summary)

No more than 10% in a moderate severity (See [Attachment 12](#), page 5, for descriptions of fire severity ratings). No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
 Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, riparian veg condition, large woody debris	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.
 Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
 The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regime III
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the sediment, water Potentially Adverse Overstory mortality shall not cause RHCA widths are adequate to Not Likely To

RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	quality, habitat elements, water yield		the ECA to exceed 15% in the watershed.	buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Adversely Affect
			Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.		
			Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.		
			Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.		
			Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds	sediment, water	No Effect	No criteria.	No at risk salmonids and/or	No Effect

without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	quality, habitat elements	habitat present.
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the sediment, water Potentially Adverse Overstory mortality shall not cause RHCA widths are adequate to Not Likely To

RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	quality, habitat elements, water yield		the ECA to exceed 15% in the watershed.	buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Adversely Affect
			Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.		
			Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.		
			Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.		
			Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds	sediment, water	No Effect	No criteria.	No at risk salmonids and/or	No Effect

without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	quality, habitat elements	habitat present.
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
 Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Burned acres cannot exceed 3% of the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with</p>	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements, water
yield

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements</p>	<p>No Effect</p>	<p>Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3). Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p> <p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the sediment, water Potentially Adverse Overstory mortality shall not cause RHCA widths are adequate to Not Likely To

RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	quality, habitat elements, water yield		the ECA to exceed 15% in the watershed.	buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Adversely Affect
			Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.		
			Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.		
			Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.		
			Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds	sediment, water	No Effect	No criteria.	No at-risk species present.	No Effect

without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA.

No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)). Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings). No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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			natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
			For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian

vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
 The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>No more than 5% of the treated acres within the RHCA will be burned.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on Attachment 1).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements, water
yield

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regime III
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years. For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at-risk species present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)). Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)). Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
 Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on Attachment 1).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements, water
yield

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Cedar/Hemlock/fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements, water yield

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fire Support
Work Element:	Fire/spike camp

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCA's in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Take, water quality and habitat elements	Potentially Adverse	No criteria.	Activity is too complex to develop criteria at this scale. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Take, water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	"Black" line

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Shade, sediment and temperature	Potentially Adverse	<p>No blackline construction perpendicular to the stream channel.</p> <p>Non-mechanized black line construction is allowed within the RHCA but within the fire severity guidelines in Attachment 12 (and summarized below).</p> <p>Fire severity should not exceed a rating of "low" for 90% of the RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See Attachment 12, page 5, for descriptions of fire severity ratings).</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>the extent of the burn is not sufficient to elevate sediment delivery;</p> <p>does not consume (size or amount) of large woody debris to a level that would affect stream function;</p> <p>does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p>	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Shade, sediment and temperature	Potentially Adverse	No blackline construction perpendicular to the RHCA (up the slope) within 500 feet of any stream channel (see Attachment 1).	Blackline running upslope has the potential to create erosion paths with delivery to stream channels. The buffer of 500 feet is based upon concentrated delivery distances from research (Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or	Shade, sediment and temperature	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	“Wet” line-foam line

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	Potentially Adverse	No foam lines or water with surfactants (wet lines) within RHCAs. For water drafting, SEE: Prescribed Fire Activity Type; Fireline Construction/Holding Actions Activity Component; Drafting to fill engines/tenders Work Element.	Criteria is sufficient to avoid potential adverse effects because it would prevent the introduction of chemical additives to the water column.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	Drafting to fill engines/tenders

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	<p>The determination of whether the pumping activity would occur in streams with at-risk fish, will require fisheries biologist review and approval.</p> <p>Water drafting/pumping will maintain a continuous surface flow of the stream, without altering the original wetted width.</p> <p>Follow the National Marine Fisheries Service guidelines for screening pump intakes (May 1996: Juvenile Fish Screen Criteria for Pump Intakes).</p> <p>No dams or channel alterations for pumping in streams occupied by at-risk fish.</p>	These criteria were derived from previous programatic consultations. They were designed to avoid adverse affects to the pathway elements. There should be a negligible risk of incidental take caused by pump entrainment or screen impingement. Water drafting/pumping will maintain a continuous surface flow of the stream, without altering the original wetted width.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	No Effect	No criteria.	Pumping/drafting cannot occur outside of the RHCA.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	Water quality, take, channel morphology and habitat element	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	Explosive built fireline

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No criteria	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	Blasting will only be allowed in areas where materials (rocks and dirt) and or sediment may not potentially reach live waters.	Consult locally. These activities do not pose the potential for adverse affects to at-risk fish species. RHCA buffers are adequate to prevent delivery of sediment.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality, take, channel morphology and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	Hand built fireline

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No fireline within RHCAs, except: Natural barriers, hand-build line parallel to the stream channel and at least one-site potential tree or 100 feet distance from the stream (whichever is greater). Or, Hand-build fireline perpendicular to the stream channel with waterbars and located at least one site-potential tree height or 100 feet from the edges of the channel (whichever is greatest).	Hand-built firelines built perpendicular to the stream and lacking water bars have the potential to deliver sediment. See Attachment 2 (sediment delivery).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	Helicopter dipping

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Take	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No helicopter dipping from waters that are known to be (or may be) contaminated with diseases or exotic species (including: whirling disease, zebra mussels, noxious aquatic weeds).	Consult locally. No at risk salmonids and/or habitat present.	Not Likely to Adversely Affect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	Machine built fireline

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No machine built fireline within 500 feet of any channel, including intermittent channels (see Figure 4.26 and "Importance of small streams" in Attachment 1). No machine built fireline construction perpendicular to the RHCA (up the slope) within 500 feet of any stream channel (see Attachment 1).	Consult locally. With these criteria, these activities do not pose the potential for adverse effect to at-risk fish species because minimal disturbances beyond 500 feet of the stream channel has extremely small chance of delivering sediment.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	Natural barriers riparian/wetlands

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	Using natural barriers to design fuel breaks should not require any mechanical or hand-built firelines.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Fireline Construction/Holding Actions
Work Element:	Pumping from streams/ponds using portable pumps

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	<p>The determination of whether the pumping activity would occur in streams with at-risk fish, will require fisheries biologist review.</p> <p>Water drafting/pumping will maintain a continuous surface flow of the stream, without altering the original wetted width.</p> <p>Follow the National Marine Fisheries Service guidelines for screening pump intakes (May 1996: Juvenile Fish Screen Criteria for Pump Intakes).</p> <p>No dams or channel alterations for pumping in streams occupied by at-risk fish.</p>	These criteria were derived from previous programatic consultations. They were designed to avoid adverse affects to the pathway elements. There should be a negligible risk of incidental take caused by pump entrainment or screen impingement. Water drafting/pumping will maintain a continuous surface flow of the stream, without altering the original wetted width.	Not Likely to Adversely Affect
The action occurs outside RHCAs, in any watershed (those both with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery; and in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	No Effect	No criteria.	Pumping/drafting cannot occur outside of the RHCA.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to	Water quality, channel morphology and habitat element	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Helicopter Landing Sites and other Operational Facilities
Work Element:	Helicopter support sites; refuel, alumigel mix sites, etc.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs within the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of the action requires site-specific analysis.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No hauling during wet weather on non-paved roads. Short spurs with no instability concerns, will be obliterated and re-vegetated immediately after activity is completed. All helicopter fueling/mixing operations require an approved transportation, storage, and emergency spill plan. Other fueling operations will consist of a slip-tank not greater than 250 gallons.	Criteria is sufficient to avoid potential adverse affects because it would prevent the introduction of chemicals and/or fuels to the water column.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ignition
Work Element:	All except where otherwise noted
This Work Element includes: • Hand ignition • Mechanical ignition • Aerial ignition	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Shade, sediment and temperature	Potentially Adverse	Intentional ignition in RHCAs will be designed so as not to prevent attainment of RMOs. No aerial ignition within RHCA. No refueling within any RHCA. SEE: Prescribed Fire Activity Type; All Vegetation Treatments for the effects of prescribed fire to vegetation.	These activities do not pose the potential for adverse affects to at risk salmonid species or their habitats. (References: SEE Attachment 2 for information on prescribed fire).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Shade, sediment and temperature	Potentially Adverse	SEE: Prescribed Fire Activity Type; All Vegetation Treatments for project criteria of prescribed fire to vegetation.	Type; All Vegetation Treatments for the rationale of prescribed fire to vegetation.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Shade, sediment and temperature	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated	sediment, water quality, habitat elements, water	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely To Adversely Affect
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critical habitat or unoccupied habitat yield
critical to species recovery.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.
Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see **Attachment 3**).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements</p>	<p>No Effect</p>	<p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p>	<p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p> <p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect
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The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element. No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Burned acres cannot exceed 3% of the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with</p>	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian

			<p>vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p> <p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p>		
<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements</p>	<p>Potentially Adverse</p>	<p>No more than 5% mortality of overstory trees.</p> <p>Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>

Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

are available.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

SEE Mechancial

Treatment -all except
where otherwise noted.

SEE, Activity Type:
Mechanical Treatments;
Activiy Component Rehabilitation, removal
of excess vegetation and slash
And, Activity Type:
Mechancial Treatmens;
Harvest Prescription/Implementation

For ignition, SEE Activity
Type Prescribed Fire; Activity
Componet: Ignition.

For blackline construction SEE
Activity Type:
Prescribed Fire; Activity Component;
Fireline Construction/ Holding
Actions

The action occurs outside the
RHCA in watersheds with at-risk
fish species or with designated
critical habitat or unoccupied habitat
critical to species recovery.

sediment, water
quality, habitat
elements, water
yield

Potentially Adverse

Overstory mortality shall not cause
the ECA to exceed 15% in the
watershed.
Mortality shall not exceed 10-30%
of the remaining overstory trees in
the project area.
Hydrologist will insure that the
overstory mortality will not
adversely alter the flow regimes at
the project scale.
Activities will not alter the timing,
magnitude, duration, and spatial
distribution of peak, high, and low
flows.

Ensure that the project does not
prevent or retard attainment of
RMOs and is consistent with
appropriate biological opinions.
Ensure that the project does not
retard progress towards "properly
functioning" condition of the

RHCA widths are adequate to
buffer the stream (based on
Attachment 1).
The amount of area expected
to be treated at low intensity is
not expected to result in
adverse erosion and sediment
delivery to stream channels.

Not Likely To
Adversely Affect

following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

SEE Mechanical

[Treatments - all except where otherwise noted](#)

For piling SEE Activity Type:
Mechanical Treatments; Activity
Component **Rehabilitation and removal
of excess vegetation and slash**
For Thinning See Activity Type:
Mechanical Treatments; Harvest Prescription
Implementation; **Understory treatments**

For Ignition See: Activity Type:
Prescribed Fire; Activity
Component: **Ignition.**

For blackline construction See
Activity Type: Prescribed
Fire; Activity Component
Fireline Construction/Holding
Actions; **Blackline Construction**

The action occurs outside the
RHCA in watersheds with at-risk
fish species or with designated
critical habitat or unoccupied habitat
critical to species recovery.

sediment, water
quality, habitat
elements, water
yield

Potentially Adverse

Overstory mortality shall not cause
the ECA to exceed 15% in the
watershed.
Mortality shall not exceed 10-30%
of the remaining overstory trees in
the project area.
Hydrologist will insure that the
overstory mortality will not
adversely alter the flow regimes at
the project scale.
Activities will not alter the timing,
magnitude, duration, and spatial
distribution of peak, high, and low
flows.

Ensure that the project does not
prevent or retard attainment of
RMOs and is consistent with
appropriate biological opinions.
Ensure that the project does not
retard progress towards "properly
functioning" condition of the
following relevant indicators in the
Watershed Condition Pathway:

RHCA widths are adequate to
buffer the stream (based on
Attachment 1).
The amount of area expected
to be treated at moderate
intensity is not expected to
result in adverse erosion and
sediment delivery to stream
channels.

Not Likely To
Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%.(See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.</p> <p>Burning within RHCAs will require</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1.Does not result in death or injury to individual fish. 2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3.Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.
No burning within the following buffers from the edge of the bankfull channel.

Area [RHCA] Literature Summary)

<5% slope, 115 ft. buffer

6% - 10% slope, 165 ft. buffer

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

			Activity Component; Understory/single story treatments: thinning Work Element.		
			For blackline construction SEE: Prescribed Fire Activity Type; Fireline Construction Activity Component; Holding Actions		
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3). Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
**Understory/single story treatments:
thinning** Work Element.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.</p> <p>Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>No more than 5% of the treated acres within the RHCA will be burned.</p> <p>No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.</p> <p>Pile burning will cover no more than 5% of the RHCA within the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

listed salmonids.
No burning within the following
buffers from the edge of the
bankfull channel.

<5% slope, 115 ft. buffer

6% - 10% slope, 165 ft. buffer

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Ensure that the project does not
prevent or retard attainment of
RMOs and is consistent with
appropriate biological opinions.
Ensure that the project does not
retard progress towards "properly
functioning" condition of the
following relevant indicators in the
Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the riparian

			<p>vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years</p> <p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p>		
<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements</p>	<p>Potentially Adverse</p>	<p>No more than 5% mortality of overstory trees.</p> <p>Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>

no case shall either of the above time period be less than two years.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 1, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. Condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile. Minimize disturbance to riparian ground cover and vegetation.</p> <p>No more than 5% of the treated acres within the RHCA will be burned.</p> <p>No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.</p> <p>Pile burning will cover no more than 5% of the RHCA within the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

buffers from the edge of the bankfull channel.

<5% slope, 115 ft. buffer

6% - 10% slope, 165 ft. buffer

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing,

			<p>especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years</p> <p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p>		
<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements</p>	<p>Potentially Adverse</p>	<p>No more than 5% mortality of overstory trees. Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (non-anadromous) code HUC in a given year. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at-risk species/habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated	sediment, water quality, habitat elements, water	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely To Adversely Affect
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critical habitat or unoccupied habitat yield
critical to species recovery.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated	sediment, water quality, habitat elements, water	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely To Adversely Affect
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critical habitat or unoccupied habitat yield
critical to species recovery.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements</p>	<p>No Effect</p>	<p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p>	<p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p> <p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
**Understory/single story treatments:
thinning** Work Element.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile. Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage

that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees. Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

RHCA widths are adequate to buffer the stream (based on **Attachment 1**). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile. Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage

that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.
Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.
Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.
Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment, sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regenerate to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p> <p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs:</p> <ul style="list-style-type: none"> -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness 	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For piling See: **Rehabilitation and Removal of Excess Vegetation and Slash** Activity Component

For thinning See: Mechanical Treatments Activity Type; Harvest Prescription/ Implementation Activity Component; **Understory treatments - thinning**

For ignitiona See: **Ignition**

For blackline construction See Prescribed Fire Activity Type: Fireline Construction/Holding Actions: Activity component; **Blackline**

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements, water yield

Potentially Adverse

Overstory mortality shall not cause the ECA to exceed 15% in the watershed.
Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:
Road Density, Disturbance History,

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

				Riparian Condition, and Disturbance Regime (see Attachment 3).		
				Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect	

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For piling See: Mechanical Treatments
Activity Type; **Rehabilitation and
Removal of Excess Vegetation and
Slash.**

For thinning See; Harvest Prescription
Implementation; **Understory treatments
thinning**

For Ignition See; Prescribed Fire
Activity type; **Ignition**

For blackline construction See
Prescribed Fire Activity Type;
Fireline Construction/Holding
Actions; **Blackline**

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect
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			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements</p>	<p>No Effect</p>	<p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p>	<p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p> <p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids				
Activity Type:	Prescribed Fire				
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V				
Work Element:	Thin/machine pile/burn piles, Low intensity				
<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>

The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, riparian veg. condition, large woody debris

Potentially Adverse

Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile. Minimize disturbance to riparian ground cover and vegetation.

Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids. No burning within the following buffers from the edge of the bankfull channel.

<5% slope, 115 ft. buffer

6% - 10% slope, 165 ft. buffer

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.

Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.
 Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.
 Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
 The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:
 Road Density, Disturbance History,

Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 2, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile. Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage

that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.
Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.
Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.
Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated	sediment, water quality, habitat elements, water	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely To Adversely Affect
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critical habitat or unoccupied habitat yield
critical to species recovery.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated	sediment, water quality, habitat elements, water	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely To Adversely Affect
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critical habitat or unoccupied habitat yield
critical to species recovery.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements</p>	<p>No Effect</p>	<p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p>	<p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p> <p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh. Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile. Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian

vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.
 Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (non-anadromous) code HUC in a given year.
 Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
 The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and

Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes III
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian

			<p>vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p> <p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p>		
<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements</p>	<p>Potentially Adverse</p>	<p>No more than 5% mortality of overstory trees.</p> <p>Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>

Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years. For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated	sediment, water quality, habitat elements, water	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely To Adversely Affect
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critical habitat or unoccupied habitat yield
critical to species recovery.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3 Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated	sediment, water quality, habitat elements, water	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely To Adversely Affect
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critical habitat or unoccupied habitat yield
critical to species recovery.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.
Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect

Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available. Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/Broadcast Burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the RHCA. No more than 10% in a</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Mortality shall not exceed 10-30% of the remaining overstory trees in the project area. Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, habitat elements</p>	<p>No Effect</p>	<p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on Attachment 1).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Lodgepole pine/Douglas-fir/true fir, Condition Class 3, Fire Regimes IV, V
Work Element:	Thin/machine pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile. Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage

			that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.		
			For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.		
			For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.		
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>No more than 5% mortality of overstory trees.</p> <p>Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mop-up
Work Element:	All except where otherwise noted
This Work Element includes: • Engine • Hand tool • Hose lays	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Shade, sediment and temperature	Potentially Adverse	<p>The determination of whether the pumping activity would occur in streams with at-risk fish, will require fisheries biologist review.</p> <p>Water drafting/pumping will maintain a continuous surface flow of the stream, without altering the original wetted width.</p> <p>Follow the National Marine Fisheries Service guidelines for screening pump intakes (May 1996: Juvenile Fish Screen Criteria for Pump Intakes).</p> <p>No dams or channel alterations for pumping in streams occupied by at-risk fish.</p>	These criteria were designed to avoid adverse affects to the pathway elements.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Shade, sediment and temperature	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime II
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish.. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality (ash)

Potentially Adverse

No burning unless native perennial plants are adequately present to respond.

Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can

Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.

Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.

Not Likely To Adversely Affect

withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

In stream systems with elevated nutrient levels, do not exceed a fire severity rating of “moderate”. See [Attachment 12, page 5](#).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, water yield, chemical contaminants

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime II
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

6% - 10% slope, 165 ft. buffer

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime II
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime II
Work Element:	Brushbeating/mow, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime II
Work Element:	Brushbeating/mow, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.</p> <p>Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime II
Work Element:	Brushbeating/mow, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided.</p>	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regenerate to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

RMOs:

- Pool frequency
- Water temperature
- Large woody debris
- Bank stability
- Lower bank angle
- Width/depth ratio
- Surface fine sediment
- Cobble embeddedness

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality (ash)	Potentially Adverse	<p>No burning unless native perennial plants are adequately present to respond. Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years</p> <p>In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See Attachment 12, page 5.</p>	<p>Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.</p> <p>Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large Woody debris to a level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area.</p> <p>6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided.</p>	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5 for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime III
Work Element:	Brushbeating/mow, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids				
Activity Type:	Prescribed Fire				
Activity Component:	Mountain big sagebrush, Fire Regime III				
Work Element:	Brushbeating/mow, Low intensity				
Conditional Statement	Effects Pathway	Potential Effect	Project Criteria	Rationale	Final Effect

The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.

water quality,
habitat elements,
sediment

Potentially Adverse

No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See [Attachment 2](#) - Extent of effect for stream side disturbances).

To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.

Not Likely To Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

water quality,
habitat elements,
sediment

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Mountain big sagebrush, Fire Regime III
Work Element:	Brushbeating/mow, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Oak woodlands/oak-maple/interior chaparral/mountain brush, Fire Regime II
Work Element:	Activity fuel/pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, chemical contaminants	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No piling and burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>No piles on road berms.</p> <p>Piles not to exceed 10' x 10'.</p>	Buffer widths are adequate to prevent delivery of fine sediment and minimizes the potential leaching of nutrients to the stream (based on Attachment 1).	Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see **Attachment 3**).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity
Component; **Chaining** Work
Element.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
**Understory/single story treatments:
thinning** Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
**Rehabilitation, removal of excess
vegetation and slash** Activity
Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, chemical
contaminants

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Oak woodlands/oak-maple/interior chaparral/mountain brush, Fire Regime II
Work Element:	Activity fuels/pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, chemical contaminants	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No piling and burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>No piles on road berms.</p> <p>Piles not to exceed 10' x 10'.</p>	Buffer widths are adequate to prevent delivery of fine sediment and minimizes the potential leaching of nutrients to the stream (based on Attachment 1).	Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see **Attachment 3**).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity Component; **Chaining** Work Element.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, chemical contaminants</p>	<p>No Effect</p>	<p>Component. No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Oak woodlands/oak-maple/interior chaparral/mountain brush, Fire Regime II
Work Element:	Activity fuels/pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, chemical contaminants	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No piling and burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>No piles on road berms.</p> <p>Piles not to exceed 10' x 10'.</p>	Buffer widths are adequate to prevent delivery of fine sediment and minimizes the potential leaching of nutrients to the stream (based on Attachment 1).	Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see **Attachment 3**).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity Component; **Chaining** Work Element.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity

		Component.			
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Oak woodlands/oak-maple/interior chaparral/mountain brush, Fire Regime II
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, water yield, turbidity, temperature, chemical contaminants	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Oak woodlands/oak-maple/interior chaparral/mountain brush, Fire Regime II
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, water yield, turbidity, temperature, chemical contaminants	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Oak woodlands/oak-maple/interior chaparral/mountain brush, Fire Regime II
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, water yield, turbidity, temperature, chemical contaminants	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Activity fuels/pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, chemical contaminants	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No piling and burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>No piles on road berms.</p> <p>Piles not to exceed 10' x 10'.</p>	Buffer widths are adequate to prevent delivery of fine sediment and minimizes the potential leaching of nutrients to the stream (based on Attachment 1).	Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see **Attachment 3**).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

ACTIVITY TYPE For chaining
SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity
Component; **Chaining** Work
Element.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
**Understory/single story treatments:
thinning** Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
Rehabilitation, removal of excess

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, chemical contaminants</p>	<p>No Effect</p>	<p>vegetation and slash Activity Component. No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Activity fuels/pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, chemical contaminants	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No piling and burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>No piles on road berms.</p> <p>Piles not to exceed 10' x 10'.</p>	Buffer widths are adequate to prevent delivery of fine sediment and minimizes the potential leaching of nutrients to the stream (based on Attachment 1).	Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity Component; [Chaining](#) Work Element.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, chemical contaminants</p>	<p>No Effect</p>	<p>Component. No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Activity fuels/pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, chemical contaminants	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No piling and burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>No piles on road berms.</p> <p>Piles not to exceed 10' x 10'.</p>	Buffer widths are adequate to prevent delivery of fine sediment and minimizes the potential leaching of nutrients to the stream (based on Attachment 1).	Not Likely To Adversely Affect

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity
Component; [Chaining](#) Work
Element.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, chemical contaminants</p>	<p>No Effect</p>	<p>Component. No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Activity fuels/scattered/ broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (Attachment 12, page 5).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large Woody debris to a level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area.</p> <p>6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided.</p>	Not Likely To Adversely Affect

>60% slope, 450 ft. buffer

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

			For chaining SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Chaining Work Element.		
			For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.		
			For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.		
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, water yield, turbidity, temperature, chemical contaminants	Potentially Adverse	In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See Attachment 12, page 5 . Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3). Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to	Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.	Not Likely To Adversely Affect

regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity Component; **Chaining** Work Element.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, water yield, chemical contaminants

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Activity fuels/scattered/ broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity
Component; [Chaining](#) Work
Element.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, water yield, turbidity, temperature, chemical contaminants</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For chaining SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Chaining Work Element.</p>	<p>These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.</p>	<p>Not Likely To Adversely Affect</p>
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<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component. No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Activity fuels/scattered/ broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall

either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity
Component; **Chaining** Work
Element.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
**Understory/single story treatments:
thinning** Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
**Rehabilitation, removal of excess
vegetation and slash** Activity
Component.

The action occurs outside the
RHCA in watersheds with at-risk
fish species or with designated
critical habitat or unoccupied habitat
critical to species recovery.

sediment, water
quality, water
yield, turbidity,
temperature,
chemical
contaminants

Potentially Adverse

Ensure that the project does not
prevent or retard attainment of
RMOs and is consistent with
appropriate biological opinions.
Ensure that the project does not
retard progress towards "properly
functioning" condition of the
following relevant indicators in the
Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
Attachment 3).

These activities do not pose
the potential for adverse
effects to at-risk fish. Because
the RHCA is an adequate
buffer so that there is no
measurable effect from
disturbances associated with
the activity.

Not Likely To
Adversely Affect

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain

natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For chaining SEE:
Range Infrastructure Activity Type;
Rangeland Restoration Activity
Component; **Chaining** Work
Element.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
**Understory/single story treatments:
thinning** Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
**Rehabilitation, removal of excess
vegetation and slash** Activity
Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water
quality, water
yield, chemical
contaminants

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (Attachment 12, page 5).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large woody debris to a level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area.</p> <p>6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided.</p>	Not Likely To Adversely Affect

>60% slope, 450 ft. buffer

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, water yield, turbidity, temperature, chemical contaminants	Potentially Adverse	<p>In stream systems with elevated nutrient levels, do not exceed a fire severity rating of “moderate”. See Attachment 12, page 5.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, water yield, turbidity, temperature, chemical contaminants	Potentially Adverse	<p>less than two years.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p>	These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Pinyon-juniper and juniper woodlands, Fire Regime II
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riarian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large Woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Broadcast burn, Riparian areas

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, riparian veg. Condition, large woody debris	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Burned acres cannot exceed 3% of the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with</p>	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. Condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on Attachment 1).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. Condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (non-anadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/pile/burn piles, Riparian areas

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, riparian veg. condition, large woody debris

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/scatter/broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/scatter/broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/scatter/broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Fire Regime I
Work Element:	Thin/scatter/broadcast burn, Riparian areas

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
 Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
 Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1.Does not result in death or injury to individual fish.</p> <p>2.Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3.Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See Attachment 12, page 5, for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.

Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with

sediment, water quality, habitat

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

no designated critical habitat or elements
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 2 - Prescribed Fire).</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See Attachment 12, page 5, for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk	sediment, water quality, habitat	Potentially Adverse	Overstory mortality shall not cause the ECA to exceed 15% in the	RHCA widths are adequate to buffer the stream (based on	Not Likely To Adversely Affect
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fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

elements, water yield

watershed.

Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.
Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.

Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.
Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

[Attachment 1](#)).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Broadcast burn, Riparian areas

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, riparian veg. Condition, large woody debris	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Burned acres cannot exceed 3% of the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with</p>	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. Condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, riparian
veg. Condition,
large woody debris

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. Condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (non-anadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/pile/burn piles, Riparian areas

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, riparian veg. Condition, large woody debris

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/scatter/broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available. Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh. Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/scatter/broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/scatter/broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <p>1. Does not result in death or injury to individual fish.</p> <p>2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>3. Does not consume (size or amount) large woody debris to level that would affect stream function.</p> <p>4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.</p> <p>5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire).</p> <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>For piling - SEE: Mechanical Treatments Activity Type; Rehabilitation, removal of excess vegetation and slash Activity Component.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Open forest objective, Fire Regime III
Work Element:	Thin/scatter/broadcast burn, Riparian areas

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, riparian veg. Condition, large woody debris

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Ponderosa pine/Douglas fir/western larch/Jeffrey pine/lodgepole pine, Seedling/sapling objective, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

			Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.		
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 1, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available. Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh. Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 1, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
 Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 1, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect
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sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 1, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale. No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed. Burned acres cannot exceed 3% of the project area. Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed. Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. Ensure that the project does not	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 1, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (non-anadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).

The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For thinning - SEE: Mechanical
Treatments Activity Type; Harvest
Prescription/Implementation
Activity Component;
[Understory/single story treatments:
thinning](#) Work Element.

For piling - SEE: Mechanical
Treatments Activity Type;
[Rehabilitation, removal of excess
vegetation and slash](#) Activity
Component.

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, habitat
elements

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 1, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian

vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions.

RHCA widths are adequate to buffer the stream (based on Attachment 1).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 2, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs:</p> <ul style="list-style-type: none"> -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available. Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 2, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 2, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 2, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Burned acres cannot exceed 3% of the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with</p>	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 2, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian

vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (non-anadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
 The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 2, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>No more than 5% of the treated acres within the RHCA will be burned.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).
 The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 3, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at high intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	<p>Ensure that project contributes toward attainment, or progress towards attainment of RMOs (as listed below), is consistent with appropriate biological opinions and falls within a watershed which is "properly functioning" (as described within NMFS and FWS matrices of pathways and indicators). Completed matrices will be attached to the completed biological analysis. Livestock grazing will be excluded from prescribed burn units for at least two years, or a time period previously agreed upon during consultation, or the riparian vegetation has recovered sufficiently to achieve natural rates of surface erosion (whichever is greatest).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large Woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12" dbh within the intermittent RHCAs.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12" dbh.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 3, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of "low" for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity.

Area [RHCA] Literature Summary)

No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 10%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	Treatments Activity Type; Harvest Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.	RHCA widths are adequate to buffer the stream (based on Attachment 1). The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.	Not Likely To Adversely Affect
			Overstory mortality shall not cause the ECA to exceed 15% in the watershed.		
			Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.		
			Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.		
			Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.		
			Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).		
			Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can		

withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 3, Fire Regimes III, IV, V
Work Element:	Broadcast burn (thinned or not), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements, water yield	Potentially Adverse	<p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p> <p>51% - 60% slope, 430 ft. buffer</p> <p>>60% slope, 450 ft. buffer</p> <p>Fire severity should not exceed a rating of “low” for 90% of the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area (References: see Attachment 12 - Prescribed Fire). <p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment. (See Attachment 1 – Riparian</p>	Not Likely To Adversely Affect

RHCA. No more than 10% in a moderate severity. No more than 5% mortality of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, mortality of overstory trees shall not exceed 20%. (See [Attachment 12, page 5](#), for descriptions of fire severity ratings).

Area [RHCA] Literature Summary)

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Non-mechanized blackline construction is allowed with the RHCA but within the fire severity guidelines listed above.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p>	<p>sediment, water quality, habitat elements, water yield</p>	<p>Potentially Adverse</p>	<p>Prescription/Implementation Activity Component; Understory/single story treatments: thinning Work Element.</p> <p>Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Mortality shall not exceed 10-30% of the remaining overstory trees in the project area.</p> <p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects</p>	<p>RHCA widths are adequate to buffer the stream (based on Attachment 1).</p> <p>The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.</p>	<p>Not Likely To Adversely Affect</p>
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sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;

Understory/single story treatments: thinning Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 3, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	sediment, water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, habitat elements	Potentially Adverse	<p>Hydrologist will insure that the overstory mortality will not adversely alter the flow regimes at the project scale.</p> <p>No more than 5% mortality of overstory trees. Overstory mortality shall not cause the ECA to exceed 15% in the watershed.</p> <p>Burned acres cannot exceed 3% of the project area.</p> <p>Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.</p> <p>Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with</p>	Activities will not alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.	Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect at-risk fish or their occupied habitats.

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	large woody debris recruitment	<p>For the RHCAs of intermittent streams, limit overstory mortality to no more than 30%.</p> <p>Apply a silvicultural prescription that maximizes growth and reproduction of trees over 12” dbh within the intermittent RHCAs.</p> <p>Within intermittent RHCAs, do not remove by fire or other related treatment, boles greater than 12” dbh.</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.</p>	<p>Criteria will enhance long-term channel stability and sediment storage by managing for a silvicultural condition that maximizes large woody debris recruitment.</p> <p>(See Attachment 1 – Riparian Area [RHCA] Literature Summary)</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 3, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg. condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 10%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.
Burned acres cannot exceed 5% of the total watershed acres in a 5th (anadromous) or 6th (non-anadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:

RHCA widths are adequate to buffer the stream (based on Attachment 1).
The amount of area expected to be treated at low intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component; [Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type; [Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Riparian mid/upper elevation, Condition Class 3, Fire Regimes III, IV, V
Work Element:	Thin small trees/hand pile/burn piles, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, riparian veg condition, large woody debris	Potentially Adverse	<p>Burn piles at a time when fuel moisture levels are sufficient to limit creep to within 10 feet of a pile.</p> <p>Minimize disturbance to riparian ground cover and vegetation.</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p> <p>41% - 50% slope, 400 ft. buffer</p>	The streamside buffer and minimal area treated are sufficient to avoid delivery of sediment to the stream by controlling erosion and delivery.	Not Likely To Adversely Affect

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

No more than 5% of the treated acres within the RHCA will be burned.

No more than 5% scorch damage of overstory trees within the RHCA of perennial streams. In the RHCA of intermittent streams, scorch damage of overstory trees shall not exceed 20%.

Pile burning will cover no more than 5% of the RHCA within the project area.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period

which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
Understory/single story treatments: thinning Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
Rehabilitation, removal of excess vegetation and slash Activity Component.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, habitat elements

Potentially Adverse

No more than 5% mortality of overstory trees.

Burned acres cannot exceed 3% of the total watershed acres in a 5th (anadromous) or 6th (nonanadromous) code HUC in a given year.

Understory vegetation must be adequate to prevent erosion associated with the treatment prior to additional treatments in stands within the watershed.

Burned area does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed.

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with

RHCA widths are adequate to buffer the stream (based on **Attachment 1**).

The amount of area expected to be treated at moderate intensity is not expected to result in adverse erosion and sediment delivery to stream channels.

Not Likely To Adversely Affect

appropriate biological opinions.
 Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For thinning - SEE: Mechanical Treatments Activity Type; Harvest Prescription/Implementation Activity Component;
[Understory/single story treatments: thinning](#) Work Element.

For piling - SEE: Mechanical Treatments Activity Type;
[Rehabilitation, removal of excess vegetation and slash](#) Activity Component.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be

sediment, water quality, habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Broadcast burn/seed (aerial), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For aerial seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; **Aerial Seeding** Work Element.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality (ash)

Potentially Adverse

No burning unless native perennial plants are adequately present to respond. Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.

Ensure that the project does not prevent or retard attainment of

Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.

Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a

Not Likely To Adversely Affect

RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See [Attachment 12, page 5](#).

For aerial seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; [Aerial Seeding](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect

sediment, water quality, water yield, chemical contaminants

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Broadcast burn/seed (aerial), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>RMOs: -Pool frequency -Water temperature -Large woody debris -Bank stability -Lower bank angle -Width/depth ratio -Surface fine sediment -Cobble embeddedness</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

project will be timed to avoid disturbance of all life stages of listed salmonids.
No burning within the following buffers from the edge of the bankfull channel.

<5% slope, 115 ft. buffer

6% - 10% slope, 165 ft. buffer

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For aerial seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; **Aerial Seeding** Work Element.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, water yield, turbidity, temperature, chemical contaminants	Potentially Adverse	<p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>For aerial seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Aerial Seeding Work Element.</p>	These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Broadcast burn/seed (aerial), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

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26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For aerial seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; **Aerial Seeding** Work Element.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway:

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.

For aerial seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; [Aerial Seeding](#) Work Element.

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

sediment, water quality, water yield, chemical contaminants

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Broadcast burn/seed (drill), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

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16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

For seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; **Seeding - disking, drilling, fertilization and plowing** Work Element

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality (ash)

Potentially Adverse

No burning unless native perennial plants are adequately present to respond. Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.

Ensure that the project does not

Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.

Nitrate nitrogen is the primary component of post-fire nutrient increases in streams.

Not Likely To Adversely Affect

prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years

In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See [Attachment 12, page 5](#).

For seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; [Seeding - disking, drilling, fertilization and plowing](#) Work Element

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside

sediment, water quality, water yield, chemical contaminants

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Broadcast burn/seed (drill), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; **Seeding - disking, drilling, fertilization and plowing** Work Element

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For seeding, SEE: Range
Infrastructure Activity Type;
Rangeland Restoration Activity
Component; [Seeding - disking,
drilling, fertilization and plowing](#)
Work Element

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, water
yield, chemical
contaminants

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Broadcast burn/seed (drill), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

For seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; **Seeding - disking, drilling, fertilization and plowing** Work Element

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Watershed Condition Pathway:
Road Density, Disturbance History,
Riparian Condition, and
Disturbance Regime (see
[Attachment 3](#)).

Livestock grazing will be excluded
from prescribed burn units for a
time period previously agreed upon
during consultation, or a time period
which would allow the vegetation to
regeneration to a stage that can
withstand grazing effects
sufficiently to achieve and maintain
natural rates of surface erosion. In
no case shall either of the above
time period be less than two years.

For seeding, SEE: Range
Infrastructure Activity Type;
Rangeland Restoration Activity
Component; [Seeding - disking,
drilling, fertilization and plowing](#)
Work Element

The action occurs in watersheds
without at-risk fish species or with
no designated critical habitat or
unoccupied habitat critical to
species recovery. Criteria applied
using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

sediment, water
quality, water
yield, chemical
contaminants

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Brushbeating/mow/seed (drill), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>For seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Seeding - disking, drilling, fertilization and plowing Work Element</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

water quality,
habitat elements,
sediment

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Brushbeating/mow/seed (drill), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>For seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Seeding - disking, drilling, fertilization and plowing Work Element</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

water quality,
habitat elements,
sediment

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Sagebrush/cheatgrass, Fire Regimes II, III, IV
Work Element:	Brushbeating/mow/seed (drill), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>For seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Seeding - disking, drilling, fertilization and plowing Work Element</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

water quality,
habitat elements,
sediment

No Effect

No criteria.

No at risk salmonids and/or
habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regenerate to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

RMOs:

- Pool frequency
- Water temperature
- Large woody debris
- Bank stability
- Lower bank angle
- Width/depth ratio
- Surface fine sediment
- Cobble embeddedness

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality (ash)	Potentially Adverse	<p>No burning unless native perennial plants are adequately present to respond. Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See Attachment 12, page 5.</p>	<p>Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.</p> <p>Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

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51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Brushbeating/Mowing, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Brushbeating/Mowing, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Brushbeating/Mowing, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Herbicide (Spike), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Herbicide (Spike), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Great Basin, Fire Regime IV
Work Element:	Herbicide (Spike), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

RMOs:

- Pool frequency
- Water temperature
- Large woody debris
- Bank stability
- Lower bank angle
- Width/depth ratio
- Surface fine sediment
- Cobble embeddedness

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality (ash)	Potentially Adverse	<p>No burning unless native perennial plants are adequately present to respond. Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See Attachment 12, page 5.</p>	<p>Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.</p> <p>Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riarian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded from prescribed burn units for a

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	sediment, water quality, water yield, chemical contaminants	No Effect	time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Brushbeating/mow, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Brushbeating/mow, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Brushbeating/mow, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Herbicide (Spike), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Herbicide (Spike), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime III
Work Element:	Herbicide (Spike), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Broadcast burn, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

RMOs:

- Pool frequency
- Water temperature
- Large woody debris
- Bank stability
- Lower bank angle
- Width/depth ratio
- Surface fine sediment
- Cobble embeddedness

Project will be timed to avoid disturbance to spawning fish, redds, and pre-emergent fry. Project will be timed to ensure that local refugia are available.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality (ash)	Potentially Adverse	<p>No burning unless native perennial plants are adequately present to respond. Limit area of burn to <25% of watershed. Use approved ignition techniques to moderate fire intensity adjacent to the RHCA.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years. In stream systems with elevated nutrient levels, do not exceed a fire severity rating of "moderate". See Attachment 12, page 5.</p>	<p>Fire does not expose or disturb land areas sufficient to affect sediment delivery or water quality.</p> <p>Nitrate nitrogen is the primary component of post-fire nutrient increases in streams. This effect is associated with a large amount of burned biomass. This criteria ensures that plants are left in the burned area to take up excess nitrates that would otherwise be delivered to the stream.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	sediment, water quality, water yield, chemical contaminants	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Broadcast burn, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

26% - 30% slope, 325 ft. buffer

31% - 40% slope, 350 ft. buffer

41% - 50% slope, 400 ft. buffer

51% - 60% slope, 430 ft. buffer

>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Broadcast burn, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	sediment, water quality, temperature, turbidity, shade, riparian veg. condition, channel morphology, large woody debris, habitat elements (in-stream), take	Potentially Adverse	<p>Within the RHCAs having slopes greater than 10%, do not exceed a fire severity rating of “moderate” (See Attachment 12, page 5, for descriptions of fire severity ratings).</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p> <p>Burning within RHCAs will require hydrologist/fish biologist review and approval to determine that the project will be timed to avoid disturbance of all life stages of listed salmonids.</p> <p>No burning within the following buffers from the edge of the bankfull channel.</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p>	<p>The criteria prevent adverse affects to salmonids because:</p> <ol style="list-style-type: none"> 1. Does not result in death or injury to individual fish. 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are harmed. 3. Does not consume (size or amount) large woody debris to a level that would affect stream function. 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. 5. Does not impact the ecological (potential natural condition) conditions in riparian area. 6. By controlling the severity of fire on steeper slopes, erosion and transport of sediment to fish-bearing streams would be avoided. 	Not Likely To Adversely Affect

11% - 15% slope, 210 ft. buffer

16% - 20% slope, 250 ft. buffer

21% - 25% slope, 300 ft. buffer

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31% - 40% slope, 350 ft. buffer

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>60% slope, 450 ft. buffer

Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the riparian vegetation to regeneration to a stage that can withstand grazing, especially in riparian sites with woody shrubs. In no case shall either of the above time period be less than two years.

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

sediment, water quality, water yield, turbidity, temperature, chemical contaminants

Potentially Adverse

Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see [Attachment 3](#)).

These activities do not pose the potential for adverse effects to at-risk fish. Because the RHCA is an adequate buffer so that there is no measurable effect from disturbances associated with the activity.

Not Likely To Adversely Affect

Livestock grazing will be excluded

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>sediment, water quality, water yield, chemical contaminants</p>	<p>No Effect</p>	<p>from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.</p> <p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Brushbeating/mow, High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Brushbeating/mow, Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Brushbeating/mow, Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements, sediment	Potentially Adverse	<p>No brushbeating/mowing within 100 feet or one site-potential tree height (whichever is greater) from the stream channel. (See Attachment 2 - Extent of effect for stream side disturbances).</p> <p>To avoid compaction, soils will be dry and/or frozen during treatment. Cutting equipment is to be held at 12" or higher above the soil surface.</p> <p>Ensure that the project does not prevent or retard attainment of RMOs and is consistent with appropriate biological opinions. Ensure that the project does not retard progress towards "properly functioning" condition of the following relevant indicators in the Watershed Condition Pathway: Road Density, Disturbance History, Riparian Condition, and Disturbance Regime (see Attachment 3).</p>	<p>The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams. Brushbeating/Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and effects to streamside shade.</p>	Not Likely To Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	water quality, habitat elements, sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Herbicide (Spike), High intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Herbicide (Spike), Low intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Prescribed Fire
Activity Component:	Wyoming big sagebrush - Intermountain west, Fire Regime IV
Work Element:	Herbicide (Spike), Moderate intensity

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	water quality, habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site-specific conditions and project design. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	water quality, habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Fence Construction/Reconstruction/Maintenance
Work Element:	Building rock jacks

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>No material gathering within the RHCA (e.g. fence posts, braces, stays, rock, etc.).</p> <p>Only hand work is allowed.</p> <p>Rock hauling will be non-motorized unless motorized access will cause no ground disturbance.</p> <p>No vegetation removal.</p>	<p>This criteria reduces potential for sediment production and delivery. Criteria limit potential for reducing streambank stability.</p>	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	<p>No fueling within RHCAs.</p> <p>No criteria.</p>	<p>This activity has no potential for adverse affects outside of the RHCA.</p>	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	<p>No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Fence Construction/Reconstruction/Maintenance
Work Element:	Clearing right of way

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Hand brushing only with a maximum of five feet either side of fence line. No ground disturbance. Hazard trees will be retained on site. No fueling within RHCAs. Construct fences to avoid adverse concentrated cattle use of riparian area, streambanks, or areas sensitive to erosion and sediment delivery.	This criteria avoid erosion and sediment delivery and other risks associated with sediment production and delivery.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No perpendicular-to the stream fenceline can be cleared on slopes greater than 20% and within 500 feet of stream channels. No ground surface disturbance (e.g. use high blading for clearing fenceline. Avoid sediment production and delivery to live water by using standard erosion and sediment control measures.	Clearing fenceline up-slope has the potential to create erosion paths with delivery to stream channels. The buffer of 500 feet is based upon concentrated delivery distances from research (Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Fence Construction/Reconstruction/Maintenance
Work Element:	Digging post holes - manual/mechanical

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Water quality and habitat elements	Potentially Adverse	<p>No post hole digging within 25 feet from the stream channel.</p> <p>No tractor-mounted (large equipment) post hole digging within RHCA.</p> <p>No fueling within RHCAs.</p> <p>Construct fences to avoid adverse concentrated cattle use of riparian area, streambanks, or areas sensitive to erosion and sediment delivery.</p> <p>Constructed fence lines should not concentrate cattle presence on slopes directing paths and gullies perpendicular to the stream channel.</p> <p>All other fence construction within RHCAs requires local consultation.</p>	This activity reduces potential for sediment production and delivery.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Constructed fence lines should not concentrate cattle presence on slopes directing paths and gullies perpendicular to the stream channel.	This activity reduces potential for sediment production and delivery.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and affect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Fence Construction/Reconstruction/Maintenance
Work Element:	Onsite material cutting, gathering rocks, etc

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No material gathering within the RHCA (e.g. fence posts, braces, stays, rock, etc.). Only hand work is allowed. Rock hauling will be non-motorized unless motorized access will cause no ground disturbance. No vegetation removal.	This criteria reduces potential for sediment production and delivery. Criteria limit potential for reducing streambank stability.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No fueling within RHCAs. No criteria.	This activity has no potential for adverse affects outside of the RHCA.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Fence Construction/Reconstruction/Maintenance
Work Element:	Stringing wire

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Only hand work is allowed. No mechanized equipment within RHCAs. No fueling within RHCAs.	This criteria reduces potential for sediment production and delivery.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	This activity has no potential for adverse affects outside of the RHCA.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Rangeland Restoration
Work Element:	Chaining

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria	Activity is too complex to develop criteria at this scale. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	The RHCA is an adequate buffer to prevent sediment delivery from erosion associated with chaining (Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Rangeland Restoration
Work Element:	Seeding - aerial

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	This assumes that the seeds are not mixed with fertilizer.	No Effect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	This assumes that the seeds are not mixed with fertilizer.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Rangeland Restoration
Work Element:	Seeding disking, drilling, fertilizing, plowing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No ground disturbing activity (disking, drilling, and plowing) within RHCAs. SEE: Insect Suppression Activity Type, Fertilization Activity Component, for work elements and associated criteria for fertilization.	Criteria is sufficient to avoid potential adverse effects because the potential for introduction of fertilizer will be negligible (See Attachment 1).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Not Likely to Adversely Affect	No criteria.	The RHCA is an adequate buffer to prevent sediment delivery (Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	Not Likely to Adversely Affect	No criteria.	No at risk salmonids and/or habitat present.	Not Likely to Adversely Affect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)
Work Element:	All water developments - clearing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	No clearing for or construction of water For springs or seeps, restrict clearing to slopes of 20% using only non-mechanical methods.	Criteria is sufficient to avoid potential adverse effects because the disturbance limits avoid erosion and sediment delivery (Attachment 1).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Not Likely to Adversely Affect	No criteria.	The RHCA is an adequate buffer to prevent sediment delivery from erosion associated with clearing (Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats..	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)
Work Element:	All water developments - constructing apron - rubber, metal, asphalt

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	No criteria	Activity is too complex to develop criteria at this scale. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	The RHCA is an adequate buffer to prevent sediment delivery from erosion associated with the activity (Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids				
Activity Type:	Range Infrastructure				
Activity Component:	Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)				
Work Element:	All water developments - installing troughs, storage tanks, or pits				
<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	No criteria.	Activity is too complex to develop criteria at this scale. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	All stock watering should be removed as far as practical from the edges of the RHCA to minimize trailing of livestock within this area. Troughs must be equipped with a float valve. No above-ground storage tanks (except guzzlers) within the watershed.	The RHCA is an adequate buffer to prevent sediment delivery from erosion associated with troughs designed with a float valve (Attachment 1). Storage tank failures have the potential to erode and deliver sediment over long slope distances (beyond the limits of the RHCA).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)
Work Element:	All water developments - transporting materials

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Motorized transport must occur on designated roads.	This criteria reduces potential for sediment production and delivery (See Attachment 1).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	This activity has no potential for adverse effects outside of the RHCA (See Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)
Work Element:	Earthwork - cat, dragline, scraper

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	No criteria.	Consult locally. Action is too complex - requires site-specific criteria.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	No Effect	No criteria.	Wells and small constructed stock ponds (those that do not contain salmonids and often dry up), are not in the RHCA and can be constructed without adverse affects to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)
Work Element:	Pipelines - Trenching

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	No trenching within the RHCAs of perennial and intermittent streams. For springs and seeps, no pipelines or trenching within the lotic portion of the RHCA, or the RHCA associated with any stream channel.	Springs and seeps associated with lentic RHCAs can be developed without affecting salmonids, however lotic RHCAs with connectivity to habitat have the potential to result in adverse affects.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	No Effect	No criteria.	Wells and small constructed stock ponds (those that do not contain salmonids and often dry up), are not in the RHCA and can be constructed without adverse affects to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Range Infrastructure
Activity Component:	Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)
Work Element:	Rock haul/material haul

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Motorized transport must occur on designated roads. Rocks and other material will not be excavated from the RHCA.	This criteria reduces potential for sediment production and delivery (See Attachment 1).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No refueling with RHCA. No criteria.	This activity has no potential for adverse effects outside of the RHCA (See Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Recreation Facilities and Operations
Activity Component:	Existing Facilities Developed and Dispersed
Work Element:	All except where otherwise noted
This Work Element includes: • Install site furniture • Remove trees and ground vegetation, blade to create smooth surface, apply gravel, asphalt or concrete to harden site	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	Potentially Adverse	<p>To avoid root damage, no graveling and asphalt surfacing within 25 feet or .3 site-potential tree height, whichever is greater (FEMAT, page V-6 or Attachment 1) of the edge of the stream.</p> <p>Gravelling/asphalt will not expand beyond existing footprint of the disturbed area.</p> <p>Prevent human uses within this zone using barrier placements.</p> <p>For tree removal, SEE: Mechanical Treatment Activity Type; Harvest Prescription/Implementation Activity Component; Dead Trees salvage Work Element</p> <p>For vegetation removal, SEE: Mechanical Treatments Activity Type, Rehab, removal of excess vegetation and slash Activity Component</p>	Criteria will prevent introducing adverse materials into the stream. It encourages human uses away from the streambank. The criteria distance would provide adequate protection for root strength of vegetation immediately adjacent to the stream channel, important to maintaining bank stability.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	Not Likely to Adversely Affect	No criteria.	RHCA are adequate to buffer the stream from disturbance effects.	Not Likely to Adversely Affect
The action occurs in watersheds	Water quality and	No Effect	No criteria.	No at risk salmonids and/or	No Effect

without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	habitat elements	habitat present.
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Species Code:	Salmonids
Activity Type:	Recreation Facilities and Operations
Activity Component:	Install/Remove toilets
Work Element:	All except where otherwise noted
This Work Element includes: • Harden entry to building • Remove trees, excavate, construct building • Collapse building into vaults or haul structures off-site	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Ensure that PACFISH/INFISH standards & guidelines RM1 through RM3 are met. STRUCTURE REMOVAL: Allow only structure removal by collapse into the vault. CONSTRUCT BUILDING INCLUDING FOUNDATION: No foundation construction and/or installation of toilet vaults within RHCAs. Replacement of existing structure without excavation of a new foundation/vault is allowed within the RHCA.	Toilet vault excavations, foundation construction, and vault removal activities are associated with significant disturbances that have the potential to deliver sediment to streams (See Attachments 1 and 2).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Recreation Facilities and Operations
Activity Component:	Installation of other site amenities
Work Element:	Remove trees and ground vegetation, excavate, backfill

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	Potentially Adverse	<p>If PACFISH/INFISH standards & guidelines RM1 through RM3 are met, then add the following: prevent implementing these activities within 25 feet of the edge of the bankful channel, or .3 site-potential tree height, whichever is greater, (Attachment 2).</p> <p>Prevent vehicle uses within this zone by placing barriers at least 25 feet from the edge of the bankful channel.</p> <p>For Water Developments, SEE: Recreation Facilities & Operations Activity Type; Water Development Activity Component.</p> <p>For culverts and ditches, SEE: Roads & Road Maintenance Activity Type; Road Maintenance Activity Component; Adding cross drain culverts Work Element.</p>	Criteria will prevent introducing adverse materials into the stream. It encourages human uses away from the streambank. The distance of 25 feet would be adequate protection for root strength of vegetation immediately adjacent to the stream channel and important to maintaining bank stability.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	<p>For Water Developments, SEE: Recreation Facilities & Operations Activity Type; Water Development Activity Component.</p> <p>For culverts and ditches, SEE: Roads & Road Maintenance Activity Type; Road Maintenance</p>	The RHCA is adequate to buffer effects from installation of site amenities.	No Effect

<p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	<p>Water quality and habitat elements</p>	<p>No Effect</p>	<p>Activity Component; Adding cross drain culverts Work Element. No criteria.</p>	<p>No at risk salmonids and/or habitat present.</p>	<p>No Effect</p>
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Species Code:	Salmonids
Activity Type:	Recreation Facilities and Operations
Activity Component:	Obliteration/Rehabilitation of Recreation Sites
Work Element:	Install barriers (boulders, fencing, signs, etc.)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No boulder excavation or removal within RHCAs. FENCING: No post hole digging within 25 feet from the active stream channel. No tractor-mounted post hole digging within RHCA.	Disturbance associated with boulder removal/excavation has the potential to deliver sediment. Fencing criteria would avoid potential sediment and fuel delivery to streams.	Not Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	Potentially Adverse	No fueling within RHCAs. For fencing, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Fence construction/reconstruction Work Element	RHCA widths are adequate to buffer the stream (based on Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Recreation Facilities and Operations
Activity Component:	Obliteration/Rehabilitation of Recreation Sites
Work Element:	Remove any existing site furniture

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Ensure that PACFISH/INFISH standards & guidelines RM1 through RM3 are met.</p> <p>STRUCTURE REMOVAL: Allow only structure removal by collapse into the vault.</p> <p>CONSTRUCT BUILDING INCLUDING FOUNDATION: No foundation construction and/or installation of toilet vaults within RHCAs. Replacement of existing structure without excavation of a new foundation/vault is allowed within the RHCA.</p> <p>For Harden Entry to Building, and tree removal SEE: Recreation Facilities & Operations Activity Type; Existing Facilities Developd and Dispersed Activity Component.</p>	Toilet vault excavations, foundation construction, and vault removal activities are associated with significant disturbances that have the potential to deliver sediment to streams (See Attachments 1 and 2).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Recreation Facilities and Operations
Activity Component:	Obliteration/Rehabilitation of Recreation Sites
Work Element:	Rip surface, re-contour, topsoil, seed, mulch

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Ensure that PACFISH/INFISH standards & guidelines RM1 through RM3 are met.</p> <p>Avoid ground disturbances during spawning and incubation periods, then add the following: Avoid applying this action within 25' away from the bankful channel or .3 site potential tree height (whichever is greater).</p> <p>Avoid erosion (e.g. ripping on steep slopes) and transport that have the potential to deliver sediment to the stream (i.e. use silt fences). Use the following buffers:</p> <p><5% slope, 115 ft. buffer 6% - 10% slope, 165 ft. buffer 11% - 15% slope, 210 ft. buffer 16% - 20% slope, 250 ft. buffer 21% - 25% slope, 300 ft. buffer 26% - 30% slope, 325 ft. buffer 31% - 40% slope, 350 ft. buffer 41% - 50% slope, 400 ft. buffer 51% - 60% slope, 430 ft. buffer >60% slope, 450 ft. buffer</p> <p>Use ripping and re-contouring only if it would lessen the existing erodability.</p>	Criteria will prevent significant sediment input into the stream, and potential adverse affects on rooting strength so important to bank stability.	Not Likely to Adversely Affect

<p>The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.</p> <p>The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.</p>	Water quality and habitat elements	Not Likely To Adversely Affect	For mulching, SEE: Watershed Restoration Activity Type; Revegetation Activity Component; Mulch application Work Element.	No criteria.	The RHCA is adequate to buffer sediment transport/delivery to stream channels.	Not Likely to Adversely Affect
	Water quality and habitat elements	No Effect		No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Recreation Facilities and Operations
Activity Component:	Water development
Work Element:	All except where otherwise noted
This Work Element includes: • Excavate hole, pump installation • Trenching for distribution line	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	If PACFISH/INFISH standards & guidelines RM1 through RM3 are met, then add the following: Avoid trenching and pipeline installation within 25 feet of the bankful channel or .3 site-potential tree height (whichever is greater) to avoid impacts to roots of the riparian vegetation (FEMAT, Murphy - NOAA 1995, etc.). Use trenching methods that avoids sediment delivery (ie. Pipe pulling equipment).	Avoids delivery of sediment to the stream. Avoids disturbance to streamside vegetation (See FEMAT, page V-6 or Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Access for Reforestation Activities
Work Element:	Opening closed roads, including snowplowing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Sediment and turbidity	Potentially Adverse	Opening roads includes only opening gates and snow plowing roads. This activity will occur only on existing roads. Requires minimal brushing, ditch maintenance, & existing culvert maintenance. No disturbance of existing cuts and fills. Leave a minimum of 6 to 8" of snow on road surface when opening roads for planting. Ditches and culverts will be made functional. Side-cast material will not include dirt and gravel. Snow berms will not be left on the shoulder unless drainage holes are open and maintained. Travel must cease when damage to the road surface will result or is occurring, and roads must be allowed to melt out and surfaces dry and harden before traffic is allowed on them. For road maintenance, SEE: Roads and Road Maintenance Activity Type; Road Maintenance Activity Component	Criteria are sufficient to avoid potential adverse effects because design measures minimize road disturbance and avoid sediment delivery (see Attachment 2).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	Sediment and turbidity	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Animal Damage Control
Work Element:	All except where otherwise noted
This Work Element includes: • Chemical application above and below ground • Netting and associated devices for protection • Use of snap traps for animal removal	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Water quality and chemical contamination	Potentially Adverse	No criteria.	Until more information is available on sub-lethal effects, consultation must be conducted locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and chemical contamination	Potentially Adverse	No criteria.	Until more information is available on appropriate buffer widths, consultation must be conducted locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and chemical contamination	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Artificial Shade
Work Element:	Shade cards

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk fish species.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Collection of Plant Propagation Materials
Work Element:	All except where otherwise noted
This Work Element includes: • Climb to access or mechanically pick cones • Fire arm use • Pollen, scion material • Collection of seeds or other vegetative materials	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No mechanized equipment for cone collection within the RHCA.	These activities do not pose the potential for adverse effect to at-risk fish species, except collection of cones using ground-based equipment. The RHCA is adequate as a buffer to prevent sediment delivery associated with disturbances of this type.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Hand plant upland/riparian
Work Element:	Plant trees and shrubs with hoe, bar, auger

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	All fueling and fuel storage areas as well as service landings will be located outside the RHCA. Use only hand augers within the RHCA.	The RHCA is adequate as a buffer to prevent fuel from entering streams.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Natural Regeneration Surveys
Work Element:	All except where otherwise noted

This Work Element includes ALL activities within this Activity Component

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Sediment and turbidity	Potentially Adverse	Stay on designated trails. Stock handling facilities, camp facilities and improvements will be located at least 300 feet from lakes, streams, and springs. Stock handlers will be educated on at-risk fish including identification, Endangered Species Act, and how to minimize adverse affects to the species and their associated habitat.	Criteria are sufficient to avoid potential adverse affects. Avoids sediment delivery by keeping facilities well away from streams.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Sediment and turbidity	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	On site tree storage
Work Element:	Building and maintaining snow cache

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	For CACHE CONSTRUCTION: Do not build within the RHCA. Opening roads includes only opening gates and snow plowing roads. This activity will occur only on existing roads. Requires minimal brushing, ditch maintenance, & existing culvert maintenance. No disturbance of existing cuts and fills. Leave a minimum of 6 to 8" of snow on road surface when opening roads for planting. Ditches and culverts will be made functional. Side-cast material will not include dirt and gravel. Snow berms will not be left on the shoulder unless drainage holes are open and maintained. Travel must cease when damage to the road surface will result or is occurring, and roads must be allowed to melt out and surfaces dry and harden before traffic is allowed on them.	These activities do not pose the potential for adverse affect to at-risk fish species, except cache construction and snow plowing using ground-based equipment. The RHCA is adequate as a buffer to prevent sediment delivery associated with disturbances of this type.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Return visits after planting
Work Element:	All except where otherwise noted

This Work Element includes ALL activities within this Activity Component

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Sediment and turbidity	Potentially Adverse	Stay on designated trails. Stock handling facilities, camp facilities and improvements will be located at least 300 feet from lakes, streams, and springs. Stock handlers will be educated on at-risk fish including identification, Endangered Species Act, and how to minimize adverse affects to the species and their associated habitat.	Criteria are sufficient to avoid potential adverse affects. Avoids sediment delivery by keeping facilities well away from streams.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Sediment and turbidity	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Site preparation
Work Element:	All except where otherwise noted
This Work Element includes: • Mechanical scarification • Hand mechanized scarifier • Spot application of herbicides	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Furrowing, patch scarification, and dozer scarification will only be conducted on slopes of 20% or less. Avoid sediment production and delivery to live water by using standard erosion and sediment control measures. Avoid scarification on slopes over 20% (see Attachment 1 - Importance of Hill Slope Steepness). For spot application of herbicides SEE: Weeds/Chemical Treatments Activity Type; Herbicide Control Activity Component	Minimum disturbance avoids sediment transport/delivery.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Reforestation
Activity Component:	Site preparation
Work Element:	Hand scalp/grubbing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Hoeing of plant roots allowed outside of 25 feet or .3 site-potential tree height from the stream (whichever is greatest).	The buffer is adequate to avoid potential sediment delivery (Attachment 1).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Not Likely To Adversely Affect	No criteria.	No potential adverse affect outside the RHCA.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Decommissioning Roads
Work Element:	All except where otherwise noted
This Work Element includes: • Re-contouring • Water barring • Roadbed ripping • Culvert removal • Berm/barrier construction • Side cast pullback	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	No criteria.	Activity is too complex to develop criteria at this scale. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	For RE-CONTOURING AND SIDECAST PULLBACK AND EXCAVATION - No activity would be permitted within 300 feet of any stream channel at slopes greater than 30 percent. No activity would be allowed within 500 feet of any stream channel at slopes greater than 70%. FOR BERM/BARRIER CONSTRUCTION - . Materials for berms (rock, logs, etc.) will not be removed from the RHCA. Include erosion controls and containment structures to avoid the increased risk of sediment delivery. Revegetation measures will help to reduce erosion. Road drainage ditches will not be directly connected to the stream. Cross drainage should remove sediment from the road at a distance	The Interior Columbia Basin Science Assessment addressed sediment delivery potential for land disturbing actions. For worst case, the 5% exceedance potential was used to predicate not likely to adversely affect. (See Figure 4.27, Attachment 1; Attachment 10, pages 16, 21, and C-3).	Not Likely to Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	sufficient to avoid delivery. No criteria.	No at risk salmonids and/or habitat present.	No Effect
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<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	<p>RECONTOURING AND SIDECAST PULLBACK are desired long-term. Pull back to original contour, use filter cloth to minimize erosion, and seed native vegetation.</p> <p>Pull back material should be end hauled out of the RHCA.</p> <p>WATER BARRING is suggested to be located 25 feet of the edges of the stream channel at a spacing prescribed by the Riparian Road Guide (1994) in Attachment 7.</p> <p>CULVERT REMOVAL for intermittent channels: 1). Activity occurs during the dry season and the channel is dry (applies to intermittent streams only), 2). Reduce fill grade to < 30% adjacent to the stream channel. 3). Use filter cloth or other erosion controls to prevent erosion on, and sediment delivery from the road fill.</p> <p>For perennial streams, SEE Road and Road Maintenance Activity Type; Road Maintenance Activity Component; Culvert Maintenance.</p> <p>BERM CONSTRUCTION: Prevent implementing these activities within 25 feet or .3 site-potential tree height, whichever is greater. (See Attachment 1) of the edge of the bankful channel.</p> <p>ROADBED RIPPING: SEE Watershed Restoration Activity Type, Hillslope Erosion Control, Road/Landing Ripping.</p>	<p>The Interior Columbia Basin Science Assessment addressed sediment delivery potential for land disturbing actions. For worst case, the 5% exceedance potential was used to predicate negligible potential effect. (See Figure 4.27, Attachment 1).</p> <p>Water barring reduces sediment delivery potential if applied as per the criteria.</p> <p>Roadbed ripping reduces erosion potential and therefore reduces the likelihood of increasing sediment delivery, except where the road has naturally re-vegetated.</p> <p>CULVERT REMOVAL would be restricted to reduce the potential for sediment delivery. Criteria will prevent introducing adverse materials into the stream. It encourages human uses away from the streambank. The distance of 25 feet would be adequate protection for root strength of vegetation immediately adjacent to the stream channel and important to maintaining bank stability (See Attachment 1).</p>

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	New Construction/Reconstruction
Work Element:	All except where otherwise noted
This Work Element includes: • Vegetation clearing – pioneering activities • Installation of drainage features includes bridge construction • Earthwork • Finish • Surfacing	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Activities are too complex - consult locally Most work elements are associated with potential for increased sediment delivery and alteration of streamflow regimes.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Adding crossdrain culverts

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Water quality and habitat elements	Potentially Adverse	No criteria	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Adding cross drains is often designed to decrease sediment delivery potential.</p> <p>Assure that new cross-drains outside of the RHCA are not linked to any stream channel (perennial and/or intermittent).</p> <p>Drainage of existing road systems can be redesigned to substantially reduce sediment delivery, often to only a fraction of the original amount, by increasing the frequency of relief, See Attachment 10.</p>	<p>Cross drains that remove water and fine sediment from the road and inside ditch have the potential to decrease sedimentation to the stream system by:</p> <p>1). Decreasing the amount of concentrated runoff on the road, and by</p> <p>2). delivering road runoff to natural vegetative filters that hold the sediment on the landscape.</p>

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Blading and grading

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	<p>Blading is restricted to outside 25 feet distance from the edges of any stream channel.</p> <p>Do not undercut cut slopes.</p> <p>Sidecasting is not allowed.</p> <p>No road side berms allowed.</p> <p>Include erosion controls and containment structures to avoid the increased risk of sediment delivery.</p> <p>SEE: Roads and Road Maintenance Activity Type, Road Maintained, Ditch Clean-out.</p>	Criteria is sufficient to avoid potential adverse effects because the 25 foot no-action zone would minimize risks of sediment delivery from the road surface disturbance. Sidecasting may result in unintentional sediment delivery. Berms may concentrate road runoff which, within the RHCA, has the potential to be delivered directly to the stream.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	<p>Leave no outside berms.</p> <p>Do not undercut cut slopes.</p>	Berms may concentrate road runoff which has the potential to be delivered, via the road, to the stream system.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Bridge maintenance - riprap, deck cleaning, guard rail repair, abutment repair

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria	<p>The complexity of this activity requires knowledge of site specific conditions and project design, consult locally.</p> <p>Bridge maintenance activities may require the use of equipment that has the potential to increase erosion and sediment delivery.</p>	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Culvert maintenance

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Culvert replacement within RHCAs has the potential to adversely affect at-risk fish. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Culvert cleanout should be used to remove sediment and debris (and other blockages) which impede culvert functionality. For cross drain culverts, SEE: Roads and Road Maintenance Activity Type, Road Maintenance Component, Adding cross drain culverts Work Element.	Outside the RHCA, only cross drain (relief) culverts occur. Where road ditches are linked to the channel network, these serve to remove water and sediment from the channel system.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Consider using the following criteria to reduce short-term effects of culvert replacements on perennial streams to Not Likely to Adversely Affect:</p> <ul style="list-style-type: none"> - Dewater stream channel associated with the culvert - Maximize sediment/erosion controls on road fills (silt fences, straw bales, geotextile, - Any settling basins will be constructed off-channel. - Collect sediment behind strawbales, silt fences, etc. will be removed from the channel prior to restoring streamflow. <p>For example, see Goat Creek Culvert Replacement (Attachment 6).</p> <p>Ensure that the following CFR is used in project design: Clean Water Act, 40 CFR 232.3(c)(6)(vii) - "the design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body."</p> <p>Culvert cleanout should be used to remove sediment and debris (and other blockages) which impede culvert functionality.</p> <p>Avoid ground disturbances during spawning and incubation periods.</p> <p>For cross drain culverts, SEE: Roads and Road Maintenance Activity Type, Road Maintenance Component, Adding cross drain culverts Work Element.</p>	<p>Culvert cleanout should be routine maintenance. Cross-drainage culvert form pathways for sediment transport. Culvert cleanout can reduce the amount of sediment available for transport to streams.</p> <p>Functioning ditches effectively direct water and sediment away from the road surface, and with cross drains, minimizes erosion and delivery to stream channels.</p>

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Disposal site use

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	No Effect	No criteria.	Consult locally. The RHCA buffer is adequate to prevent adverse effects.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Ditch cleanout

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>No ditch cleanout within 25 feet from the edges of any stream channel or crossing (see Attachment 9).</p> <p>No cleanout within any ditch that drains directly to a stream channel. Ditches directly connected to a stream channel require adequate cross drainage to avoid sediment delivery.</p> <p>Use care to not undercut the ditch back slope.</p> <p>Where needed, add ditch armor to reduce potential erosion/sedimentation.</p> <p>No road-edge berms will be left after cleanout.</p>	<p>Cleaning roadside ditches usually results in a net decrease of sediment available for transport to streams. Roadside ditches form pathways for sediment storage and transport. Cleanout can reduce the amount of sediment available, however ditch grading, which is one type of cleanout, has been found to increase erosion, sedimentation significantly (Luce 2001 - see Attachment 9). By preventing ditch cleanout within 25 feet from the stream edge, those ditches that are connected forces increased sediment into the vegetative buffer. Functioning ditches effectively direct water away from the road surface, and with cross-drains, minimizes erosion and delivery to stream channels.</p>	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Ditches directly connected to a stream channel require adequate cross drainage to avoid sediment delivery.</p> <p>Use care to not undercut the ditch back slope.</p>	Any potential ground disturbing activity and delivery of sediment via road ditches would be avoided.	Not Likely to Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	Where necessary, add ditch armor to reduce potential erosion & sedimentation. No road-edge berms will be left after cleanout. No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Dust abatement - water or chemical

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No Chemical dust abatement allowed in RHCA's. For water drafting, SEE: Mechanical Treatment Activity Type; Dust abatement Activity Component; Water Drafting Work Element.	Use of chemical abatements can be toxic to fish and riparian vegetation.	Not Likely to Adversely Affect
The action occurs outside of RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Outside of the RHCA and in areas with no drainage to stream, the following chemical dust abatements are allowed: MgCl ₂ or CaCl ₂ salts. Apply dust-abatement additives and stabilization chemicals so as to minimize the likelihood that they will enter streams, (see e.g., Heffner 1996, Attachment 5). Spill containment equipment will be available during chemical dust abatement application. Do not apply dust abatement chemical during rainfall. For water drafting, SEE: Mechanical Treatment Activity Type; Dust abatement Activity Component; Water Drafting Work Element.	Chemical palatives bind the road surface sediments and reduce the potential for erosion and sediment delivery. It is unlikely that receiving waters can have concentrations of chloride salts high enough to cause growth or survival problems for fishes or riparian vegetation (Heffner 1996 - Attachment 5).	Not Likely to Adversely Affect
The action occurs in watersheds	Water quality and	No Effect	No criteria.	No at risk salmonids and/or	No Effect

without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

habitat elements

habitat present.

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Roadside brushing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>No brushing within 25 feet of stream crossings or of any stream channel.</p> <p>All Large Woody Debris (LWD) must remain on site.</p> <p>Brushing (cutting vegetation) will be minimal along roads where the vegetation is stabilizing slopes.</p> <p>No ground surface disturbance (use high blading).</p> <p>For Refueling, SEE: Access and Equipment Maintenance Activity Type, Fueling/Maintenance Activity Component.</p>	Any potential ground disturbing activity would be avoided. Action would not affect stream shade provided by plants near the channel.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No ground surface disturbance (use high blading).	Any potential ground disturbing activity and delivery of sediment via road ditches would be avoided.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Slide removal

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Refer to PACFISH/INFISH Standards and Guidelines RF3 (page C-11 in PACFISH).</p> <p>Apply activity where slide damage does not degrade the road prism. Slide material is to be end-hauled off-site if no further mass movement would result from removal of the slide materials.</p> <p>Include erosion controls and containment structures to avoid the increased risk of sediment delivery.</p> <p>Revegetation measures will help to reduce erosion.</p>	These actions can reduce potential sediment delivery post-slide. Allows action on small slides (those that do not degrade the road prism). Removing slide material decreases the potential for sediment delivery because the material is no longer available for transport.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Surface rocking (rock replacement)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Road surfaces may be upgraded with surface rock to reduce erosion and sedimentation so long as cut and fill-slopes are not enlarged or disturbed. Gravel used for this purpose should be washed and cleaned of fines off-site. For blading SEE: Roads and Road Maintenance Activity Type; Road Maintenance Component; Blading and grading Work Element.	Rocking stabilizes the road surfaces and reduces the potential for erosion and sedimentation.	Not Likely to Adversely Affect
The action occurs outside of RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Road surfaces may be upgraded with surface rock to reduce erosion and sedimentation so long as cut and fill-slopes are not enlarged or disturbed. Gravel used for this purpose should be cleaned of fines. For blading SEE: Roads and Road Maintenance Activity Type; Road Maintenance Component; Blading and grading Work Element.	Rocking stabilizes the road surfaces and reduces the potential for erosion and sedimentation.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

using this conditional statement
assume that activity effects inside
these watersheds would not be
transferred downstream and effect
at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Maintenance
Work Element:	Traffic control

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	No Effect	No criteria.	The activity does not contribute any turbidity or sediment to the environment.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Turbidity and suspended sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Restoration
Work Element:	Bridge replacement

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	Consult locally. No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Consider using the "required mitigation" measures in the Burgdorf Bridge replacement example to reduce effects (See Burgdorf Bridge Replacement example - Attachment 8).	New bridges may restore channel integrity and flood capacity condition. The example "mitigations" were designed to accomplish these restoration objectives.

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Restoration
Work Element:	Culvert installation and upgrade

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Effects of this activity must be addressed at the local level. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Culvert cleanout should be used to remove sediment and debris (and other blockages) which impede culvert functionality. SEE: Roads and Road Maintenance Activity Type, Road Maintained Component, Adding cross drain culverts Work Element. Avoid ground disturbances during spawning and incubation periods.</p> <p>Consider using the following criteria to reduce short-term effects of culvert replacements on perennial streams to Not Likely to Adversely Affect:</p> <ul style="list-style-type: none"> - Dewater stream channel associated with the culvert - Maximize sediment/erosion controls on road fills (silt fences, straw bales, geotextile, - Any settling basins will be constructed off-channel. - Collect sediment behind strawbales, silt fences, etc. will be removed from the channel prior to restoring streamflow. <p>See, for example, Goat Creek Culvert Replacement (Attachment 9).</p> <p>Ensure that the following CFR is used in project design: Clean Water Act, 40 CFR 232.3(c)(6)(vii) - "the design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body."</p>	<p>Culvert cleanout should be routine maintenance. Cross-drainage culvert form pathways for sediment transport. Culvert cleanout can reduce the amount of sediment available for transport to streams. Functioning ditches effectively direct water and sediment away from the road surface, and with cross drains, minimizes erosion and delivery to stream channels.</p>

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Restoration
Work Element:	Installation of drainage dips and waterbars

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Building of water bars or installation of drain dips is allowed 25 feet outside of bankfull stream channel. Include erosion controls and containment structures to avoid the increased risk of sediment delivery. Spacing of water barrs should meet specifications as prescribed by the Riparian Road Guide (1994) in Attachment 7 .	Water barring reduces sediment delivery potential if applied as per the criteria (Riparian Road Guide 1994).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Spacing of water barrs should meet specifications as prescribed by the Riparian Road Guide (1994) in Attachment 7 . Include erosion controls and containment structures to avoid the increased risk of sediment delivery.	Waterbars are intended to improve road surface drainage. RHCAs are adequate to buffer any associated sediment production.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Restoration
Work Element:	Storm proofing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements SEE all work elements under Roads & Road Maintenance Activity Type, Roads Maintained and Decommissioning Components.	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Restoration
Work Element:	Surface material processing - in place rock crushing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	No rock pits or crushing operations within the RHCA. For road surfacing SEE: Roads and Road Maintenance Activity Type; Roads Maintenance Activity Component; Surface Rocking/Rock Replacement Work Element.	Rock pits and crushing operations within RHCAs has the potential to deliver sediment to stream channels. Road surfacing reduces erosion by stabilizing the road surface and reduces potential sediment delivery.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	No Effect	No criteria.	RHCAs are adequate as buffers of sedimentation from activities associated with this Work Element. Road surfacing increases infiltration capacity and decreases road runoff (potential sediment delivery).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Roads & Road Maintenance
Activity Component:	Road Restoration
Work Element:	Surface shaping and draining

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat element	Potentially Adverse	Blading restricted to outside 25 feet distance from the edges of any stream channel. No sidecasting bladed material within RHCA No road side berms allowed within the RHCA. For ditch cleanout - SEE: Roads and Road Maintenance Activity Type; Road Maintenance Activity Component; Ditch Clean-out Work Element.	Criteria is sufficient to avoid potential adverse effects because the 25 foot no-action zone would minimize risks of sediment delivery from the road surface disturbance. Sidecasting may result in unintentional sediment delivery. Berms may concentrate road runoff which, within the RHCA, has the potential to be delivered directly to the stream.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Leave no outside berms. For ditch cleanout - SEE: Roads and Road Maintenance Activity Type; Road Maintenance Activity Component; Ditch Clean-out Work Element.	Berms may concentrate road runoff which has the potential to be delivered, via the road to the stream system.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this condition assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Aspen Restoration
Work Element:	Mechanical root shearing

Conditional Statement	Effects Pathway	Potential Effect	Project Criteria	Rationale	Final Effect

SEE: Activity
 Type - Mechanical
 Treatments;
 Activity
 Component -
 Subsoiling.

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Fish population Recovery/Enhancement
Work Element:	All except where otherwise noted
This Work Element includes: • Fish barrier installation or removal • Exotic species removal – trapping • Exotic species removal - Rotenone and Antimycin A (Fintrol)	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. FISH BARRIER CONSTRUCTION is too complex for application of broad criteria - consult locally. Fish barrier installations, removals, and other instream structures require local design considerations to assess affect because they can pose long-term consequences for channel structure and function.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>		<i>Rationale</i>	
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, Take, and habitat elements	FISH REMOVALS: Follow terms and conditions of the 10(a)(1) or Section 6 State permits for listed, and other State permits for non-listed salmonids.		Fish population recovery activities require attention to terms and conditions to exempt "take" under ESA, or to reduce the adverse effects of fish toxicants such as rotenone.	

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Instream Restoration
Work Element:	All except where otherwise noted
This Work Element includes: • Helicopter operations • Hilti drill operations • Mulching for erosion control • Placement of boulders or large woody material	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Instream Restoration
Work Element:	Powersaw operation

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No refueling within the RHCA.	Criteria are sufficient to avoid potential adverse affects.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	No Effect	No criteria.	The RHCA is an adequate buffer.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Interpretation/Conservation Education
Work Element:	All except where otherwise noted
This Work Element includes: • Signing • Viewpoint construction • Trail access / building	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	Potentially Adverse	Placement of signs will not expand beyond the footprint of existing disturbed area. SEE Recreation and Facilities Operations Activity Type, Existing facilities Developed and Dispersed Activity Component. SEE Trails and Trail Maintenance Activity Type	Criteria will prevent introducing adverse materials into the stream. It encourages human uses away from the streambank. The criteria distance would provide adequate protection for root strength of vegetation immediately adjacent to the stream channel, important to maintaining bank stability. RHCA are adequate to buffer the stream from disturbance effects.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality	Not Likely to Adversely Affect	No criteria.		Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Meadow Restoration
Work Element:	Mowing

Conditional Statement	Effects Pathway	Potential Effect	Project Criteria	Rationale	Final Effect
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SEE:
Prescribed Fire
Activity Type;
Sagebrush Activity
Component(s),
Mowing /
Brushbeating
Work Elements

SEE:
Prescribed Fire
Activity Type;
Sagebrush Activity
Component(s),
Mowing /
Brushbeating
Work Elements

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Monitoring Fish and Wildlife
Work Element:	All except where otherwise noted
This Work Element includes: • Fish snorkeling or underwater video • Channel conditions survey, fish habitat inventory • Wildlife and fish telemetry • Wildlife denning/nesting surveys • Direct wildlife observation • Aerial wildlife counts • Redd counts • Fish electroshocking	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
In RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No criteria	Consult locally. Consultation related to Incidental Take has been completed through State and regulatory agency processes. Follow appropriate State and Federal permits that permit 'take' under 10(a)(1a).	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Quarry Restoration
Work Element:	Waste storage

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements, and chemical contamination	Potentially Adverse	No criteria	Consult locally. Mine-wastes and related contaminants have the potential to produce serious/severe adverse affects.	Potentially Adverse
The action occurs outside of RHCA's in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements, and chemical contamination	Potentially Adverse	For toxic waste, consult locally. For non toxic waste, quarry restoration is allowed outside of RHCA's	Criteria are sufficient to avoid potential adverse affects because design measures avoid sediment delivery (see Attachment 2).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with	Water quality and habitat elements,	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

and chemical contamination

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Species Code:	Salmonids				
Activity Type:	Threatened, Endangered Species Habitat Restoration				
Activity Component:	Riparian Improvement				
Work Element:	All except where otherwise noted				
This Work Element includes ALL Work Elements within this Activity Component					
<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No ground disturbing activity (disking, drilling, and plowing) within RHCAs. For Planting - Use only hand augers within the RHCA. All fueling and fuel storage areas as well as service landings will be located outside the RHCA. For fertilization, SEE: Insect Suppression Activity Type, Fertilization Activity Component	Criteria is sufficient to avoid potential adverse effects because the potential for introduction of fertilizer will be negligible (See Attachment 1).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Not Likely to Adversely Affect	No criteria.	The RHCA is an adequate buffer to prevent sediment delivery (Attachment 1).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Threatened, Endangered Species Habitat Restoration
Activity Component:	Snag Creation
Work Element:	All except where otherwise noted
This Work Element includes: • Tree climbing • Inoculation • Girdling trees • Tree topping	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No fueling of equipment within RHCAs.	Criteria are sufficient to avoid potential adverse affects because design measures avoid sediment delivery (see Attachment 2).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Blasting - surface, subsurface, and aerial

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No criteria	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	Blasting will only be allowed in areas where materials (rocks) and or sediment may not potentially reach live waters. Prevent and minimize erosion from trail construction activities by designing and maintaining proper BMPs. Route trails away from crossings to minimize length of trail sections perpendicular to stream that may direct sediment toward stream. For fueling, SEE: Access and Equipment Maintenance Activity Type, Fueling/Maintenance, Fueling/Maintenance of light equipment on site.	These activities do not pose the potential for adverse affects to at-risk fish species. RHCA buffers are adequate to prevent delivery of sediment.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement	Water quality, channel morphology and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Bridge building

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality, and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Camping

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Take, water quality and habitat elements	Potentially Adverse	No criteria.	Activity is too complex to develop criteria at this scale. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	RHCA widths are adequate to buffer the stream (based on Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Culvert installation

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, channel morphology and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affects to at-risk fish species.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Ford maintenance/construction

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality, take and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Gravel borrowing/borrow pit

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, channel morphology and habitat elements	No Effect	No criteria.	The RHCAs are adequate as a buffer to prevent the small amount of sediment potentiall produced from reaching the stream.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Horses/weed-free hay

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk fish species.	No Effect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria. For access, SEE: Activity Type - Access & Equipment Maintenance; Activity Component - Access to Worksite; Work Element - Access by foot or pack animals.	These activities do not pose the potential for adverse affect to at-risk fish species.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Puncheon/turnpike construction

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
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SEE: Activity
Type - Trails &
Trail Maintenance;
Activity
Component -
Light
Maintenance;
Work Element -
Minor Tread
Reconstruction.

SEE: Activity
Type -Trail
Maintenance;
Activity
Component -
Light
Maintenance;
Work Element -
Repair of land
structures
(puncheons,
turnpike, step).

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Reseeding edges/banks

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs within RHCAs, in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Avoid hydro-mulch within 1 site-potential tree height or 100 feet of stream. Hand planting only. No aerial seeding if mixed with any chemicals, such as fertilizers.	Avoiding direct application of mulch to the stream avoids adding sediment, nutrients, and increasing turbidity.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	No Effect	No criteria.	The RHCA is an adequate buffer.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Trail decommissioning

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
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SEE: Activity
Type - Trails &
Trail Maintenance;
Activity
Component -
Light
Maintenance;
Work Element -
Installation of
drainage features
(water bars, dips,
etc.).

SEE: Activity
Type - Trails &
Trail Maintenance;
Activity
Component -
Construction/Reco
nstruction/Heavy
Maintenance;
Work Element -
Tread
Construction.

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Trail relocation away from meadows

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
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SEE: Activity
Type - Trails &
Trail Maintenance;
Activity
Component -
Construction/Reco
nstruction/Heavy
Maintenance;
Work Element -
Tread
construction.

SEE: Activity
Type - Trails &
Trail Maintenance;
Activity
Compoment -
Light
Maintenance;
Work Element -
Installation of
drainage features
(water bars, dips,
etc.)

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Construction/Reconstruction/Heavy Maintenance
Work Element:	Tread construction

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	<p>Heavy equipment will not be used within the RHCA.</p> <p>Mechanized equipment will stay on the existing tread.</p> <p>Gravel excavation is not allowed inside the RHCA, OR IN THE STREAM CHANNEL!</p> <p>Minimize adverse effects of brushing (loss of shade, bank stability, etc.) when trails or facilities occur within RHCA by leaving as large of an uncut buffer as possible, usually at least a 10 foot buffer along intermittent and ephemeral streams, and a 25 foot buffer along perennial streams.</p> <p>Prevent and minimize erosion from trails by designing and maintaining proper drainage structures with adequate spacing of waterbars especially before stream crossings.</p> <p>Dispose of small (<3 cubic meters) slide and slump materials in stable areas and away from stream channels.</p> <p>Do not remove downed wood from sites (except to clear trails) within 1</p>	Avoids adverse loss of shade, sediment production/delivery, and potential for take.	Not Likely to Adversely Affect

site potential tree of a stream channel, unless fisheries personnel determine that large wood objectives for stream and RHCAs in the proposed project area are met.

Alternative methods are available to recruit gravel into fords. Hazard trees within one site distance will be kept on site and directionally felled towards the stream when possible.

Crews will be trained to avoid adverse take impacts to fish.

Pack stock will not be picketed or high lined within RHCA.

Camps will be located outside the RHCA.

Side casting of soil/sediment from trails directly into stream channels will not occur.

No fueling within the RHCA.

Prevent and minimize erosion from trails by designing and maintaining proper drainage structures with adequate spacing of waterbars.

RHCA buffers are adequate to prevent delivery of sediment.

Not Likely to Adversely Affect

The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.

Water quality, channel morphology and habitat elements

Potentially Adverse

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.

Water quality, channel morphology and habitat elements

No Effect

No criteria.

No at risk salmonids and/or habitat present.

No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Debris removal (slough, rocks, roots)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Apply erosion control measures to avoid sediment delivery to the stream. Repair materials (rock, logs, etc.) will not be taken from the RHCA.	Small scale of activities avoids potential adverse affects.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk fish species.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Excavating material (borrow pits, trenches)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Potentially Adverse	Apply erosion control measures to avoid sediment delivery to the stream.	The RHCAs are adequate as a buffer to prevent the small amount of sediment potentiall produced from reaching the stream.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Excavating material near water (gravel bar)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, channel morphology and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk fish species.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Installation, clean out, and repair of drainage feature (waterbars, dips, etc)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>Rolling dips and/or waterbars will be placed as needed in newly constructed and existing trails, and near bridge crossings to minimize water travel lengths and erosion, which will reduce the potential for sediment delivery to streams.</p> <p>Avoid ground disturbances during spawning and incubation periods.</p> <p>Side casting of soil/sediment from trails directly into stream channels will not occur.</p> <p>To dissipate surface runoff, place woody debris (>3" diameter) perpendicular to the downhill end of rolling dips and/or waterbars.</p> <p>Route trails away from crossings to minimize length of trail sections perpendicular to stream that may direct sediment toward stream.</p> <p>Place rolling dips/waterbars such that water and material potentially moving down trails is directed off the trail and filtered by intervening vegetation.</p>	Drainage features on trails help to reduce erosion and potential sediment delivery. Drainage features that direct water and sediment away from trails are necessary to prevent direct delivery via the trail and potential trail-generated channel system.	Not Likely to Adversely Affect
The action occurs outside the	Water quality, and	No Effect	No criteria.	The RHCAs are adequate as a	No Effect

RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	habitat elements			buffer to prevent sediment from reaching the stream.	
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Log clearing and brushing - mechanical

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, channel morphology and habitat elements	Potentially Adverse	No fueling within the RHCA.	Small scale of activities avoids any adverse affects.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Log clearing and brushing - non mechanical

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, channel morphology and habitat elements	No Effect	No criteria.	Small scale of activities avoids any adverse effects.	No Effect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse effect to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Minor tread reconstruction

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Apply erosion control measures to avoid sediment delivery to the stream. Repair materials (rock, logs, etc.) will not be taken from the RHCA. Mechanized equipment will stay on the existing tread.	Criteria will avoid sediment and fuels from entering the stream.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	No Effect	No fueling within the RHCA. No criteria.	The RHCAs are adequate as a buffer to prevent the small amount of sediment potentiall produced from reaching the stream.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Repair of land structures (punches, turnpike, steps)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, channel morphology and habitat elements	Potentially Adverse	<p>Apply erosion control measures to avoid sediment delivery to the stream.</p> <p>Repair materials will not be taken from the RHCA.</p> <p>Mechanized equipment will stay on the existing tread.</p> <p>No fueling will occur within the RHCA.</p>	<p>Near water, repair actions have potential to adversely affect at-risk salmonids. Project criteria avoid pathways for potential effects.</p>	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk fish species.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Repair of structures near water (bridges, stream fords)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology, and habitat elements	Potentially Adverse	No Criteria	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Trails & Trail Maintenance
Activity Component:	Light Maintenance
Work Element:	Signing (blazes, rock cairns, sign posts)

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not collect rocks and/or trees for signing from within the RHCA. No fueling within the RHCA. SEE: Access & Equipment Maintenance Activity Type; Fueling/Maintenance Activity Component.	Removing rocks/boulders from the stream, and risk of fuel spills with potential adverse affects are avoided by application of the criteria.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk fish species.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Hillslope Erosion Control
Work Element:	All except where otherwise noted
This Work Element includes: • Gully check structures: install straw bales, logs, silt fences • Erosion control mulch or blankets • Install wattles	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, Turbidity and suspended sediment	Potentially Adverse	No off-road vehicle transport of waddles, bales, blankets, mulch, etc. within the RHCA. No stream fording by vehicles. Do not use straw bale, log, or rock/gabion check-dams.	The RHCA is adequate as a buffer for sediment produced by all except the listed check dams which have a high incidence of failure.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Turbidity and suspended sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Hillslope Erosion Control
Work Element:	Contour felling

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Activity is too complex to develop criteria at this scale. Consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Hillslope Erosion Control
Work Element:	Road/landing ripping

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity/suspended sediment	Potentially Adverse	<p>No road or landing ripping within 25 feet of stream channel.</p> <p>Outside of the 25 foot buffer, apply the following criteria:</p> <p>Erosion and sediment controls e.g. sediment barriers and/or straw bales are in place.</p> <p>Avoid work during precipitation events and wet soil conditions. Must be on road grades less than 8 percent (see Attachment 1) and not encroaching on the streambank.</p> <p>Avoid ground disturbances during spawning and incubation periods.</p>	<p>These criteria were designed to avoid delivery of sediment to the stream by controlling erosion and transport.</p> <p>Ripping normally renders the site at lower than existing sediment potential because it results in higher infiltration immediately after the project(see Attachment 15).</p>	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity/suspended sediment	Potentially Adverse	<p>No refueling with RHCA's.</p> <p>Disturbed areas are to be seeded with all necessary erosion control measures in place upon completion of activity.</p>	The RHCA is an adequate buffer which prevents transport of fine sediment to streams.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside	Turbidity/suspended sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Hillslope Erosion Control
Work Element:	Terracing

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside of RHCAs in watersheds with at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Ground disturbing activities associated with these actions will be conducted with buffer widths sufficient to prevent delivery of sediment to streams by slope gradient <5% slope, 115 ft. buffer 6% - 10% slope, 165 ft. buffer 11% - 15% slope, 210 ft. buffer 16% - 20% slope, 250 ft. buffer 21% - 25% slope, 300 ft. buffer 26% - 30% slope, 325 ft. buffer 31% - 40% slope, 350 ft. buffer 41% - 50% slope, 400 ft. buffer 51% - 60% slope, 430 ft. buffer >60% slope, 450 ft. buffer	Criteria will prevent significant sediment input into the stream by providing adequate sediment delivery buffer and erosion control (see Attachment 1 - Importance of Hill Slope Steepness).	Not Likely to Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Turbidity and suspended sediment	No Effect	Include erosion controls and containment structures to avoid the increased risk of sediment delivery. Revegetation measures will help to reduce erosion. No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Hillslope Erosion Control
Work Element:	Trenching

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	No criteria	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Ground disturbing activities associated with these actions will be conducted with buffer widths sufficient to prevent delivery of sediment to streams by slope gradient <5% slope, 115 ft. buffer 6% - 10% slope, 165 ft. buffer 11% - 15% slope, 210 ft. buffer 16% - 20% slope, 250 ft. buffer 21% - 25% slope, 300 ft. buffer 26% - 30% slope, 325 ft. buffer 31% - 40% slope, 350 ft. buffer 41% - 50% slope, 400 ft. buffer 51% - 60% slope, 430 ft. buffer >60% slope, 450 ft. buffer	Potential sediment effects will be filtered by the RHCA.	Not Likely to Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Turbidity and suspended sediment	No Effect	Avoid work during wet periods. No trenching on unstable slopes. No sediment routing from trenches into streams. No criteria.	No at risk salmonids and/or habitat present.	No Effect
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Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	In-Channel Erosion Control
Work Element:	All except where otherwise noted
This Work Element includes:• Log, root wad or willow bundle revetments • Reshape stream banks and incised channels • Lay back vertical banks • Install barbs • Structural bank controls (riprap, etc.)	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Take and sediment	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Take and sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Revegetation
Work Element:	All except where otherwise noted
This Work Element includes: • Seeding – aerial or hand application • Planting , upland and riparian – grass, forb, shrub, tree • Mulch application • Hanson dibble	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs within RHCAs watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Avoid hydro-mulch within 1 site-potential tree height or 100 feet of stream. Hand planting only. No aerial seeding if mixed with any chemicals, such as fertilizers.	Avoiding direct application of mulch to the stream avoids adding sediment, nutrients, and increasing turbidity.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	No Effect	No criteria.	The RHCA is an adequate buffer.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Revegetation
Work Element:	Site prep - surface scarification, tilling, ripping

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Turbidity and suspended sediment	Potentially Adverse	No criteria.	Need consideration of site specific conditions - consult locally.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	<p>Avoid sediment production and delivery to streamsr by using standard erosion and sediment control measures.</p> <p>Avoid scarification on slopes over 20% (see Attachment 1 - Importance of Hill Slope Steepness).</p> <p>To prevent sediment movement into stream channel use the following buffers:</p> <p><5% slope, 115 ft. buffer</p> <p>6% - 10% slope, 165 ft. buffer</p> <p>11% - 15% slope, 210 ft. buffer</p> <p>16% - 20% slope, 250 ft. buffer</p> <p>21% - 25% slope, 300 ft. buffer</p> <p>26% - 30% slope, 325 ft. buffer</p> <p>31% - 40% slope, 350 ft. buffer</p>	Potential sediment effects will be filtered by the RHCA.	Not Likely to Adversely Affect

The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Turbidity and suspended sediment	No Effect	41% - 50% slope, 400 ft. buffer	No at risk salmonids and/or habitat present.	No Effect
			51% - 60% slope, 430 ft. buffer		
			>60% slope, 450 ft. buffer		
			No criteria.		

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Sediment Control
Work Element:	All except where otherwise noted
This Work Element includes: • Maintain instream basin • Construct instream basin (impoundment) • Instream log structure	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	No criteria.	Need consideration of site specific conditions. Consult locally.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Turbidity and suspended sediment	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Watershed Monitoring
Work Element:	All except where otherwise noted
This Work Element includes: • Establish/monitor erosion plots • Manual instream measurements • Monument plots	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Take and habitat elements, turbidity and sediment	Potentially Adverse	Streamside monitoring adjacent to actively spawning at-risk fish would be acceptable as long as duration is brief and infrequent (usually less than 15 minutes). Crews will be trained to avoid adverse impacts to fish.	The criteria minimize the potential for harassment and/or disturbance of redds. RHCA buffers are adequate.	Not Likely to Adversely Affect
The action occurs outside of RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery	Take and habitat elements, turbidity and sediment	No Effect	No erosion plots within the RHCA. No Criteria	The RHCA is adequate as a buffer for sediment produced by these activities.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Watershed Monitoring
Work Element:	Install gage

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Take, water quality, habitat	Potentially Adverse	No mechanized equipment within RHCA. Do not install gages during spawning/incubation periods. Project will be designed to avoid modifying habitat, including channel morphology. Crews will be trained to avoid adverse effects to fish.	Criteria avoid in-channel disturbance during critical spawning/incubation period, and modifications of habitat.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Take, water quality, habitat	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Watershed Restoration
Activity Component:	Watershed Monitoring
Work Element:	Instream water/sediment collection

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Take, water quality, habitat	Potentially Adverse	<p>No mechanized equipment within RHCA. No substrate sampling allowed.</p> <p>No installation of instream equipment during spawning and incubation periods.</p> <p>Sampling activities will be conducted during times when spawning fish are not present.</p> <p>Do not conduct any activities over established redds.</p> <p>Fisheries Biologist will survey areas for redds. Crews will be trained to avoid adverse impacts to fish and redds.</p>	Criteria avoid harm to listed fish by avoiding sampling during critical spawning/incubation periods.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Take, water quality, habitat	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Biological Control
Work Element:	All except where otherwise noted
This Work Element includes: • Collection and release of insects or other biological controls • Monitoring by sweep netting • Transport of bio-control agents by vehicle	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Biological Control
Work Element:	Competitive seeding

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not make aerial application of fertilizer within 300 feet of perennial streams. Fertilizer applications within 300 feet of intermittent drainages will be done only when dry. When PACFISH/INFISH standards & guidelines RA3 and RA4 are met, then add the following: do not apply within 25 feet of streams and supersaturated soils. Apply by following labeling instructions.	Criteria will prevent nitrogen spike event into water. Only high concentrations from spills are potentially toxic to fish.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Cultural Control
Work Element:	Chaining

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No ground disturbing activity (chaining) within RHCAs.	Criteria is sufficient to avoid potential adverse effects because the potential for introduction of sediment will be avoided (See Attachment 1).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	The RHCA is an adequate buffer to prevent sediment delivery from erosion associated with weed chaining (Attachment 1).	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Cultural Control
Work Element:	Fertilize - by hand, machine, or aerial

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	Do not make aerial application within 300 feet of perennial streams. Applications within 300 feet of intermittent drainages will be done only when dry. When PACFISH/INFISH standards & guidelines RA3 and RA4 are met, then add the following: do not apply within 25 feet of streams and supersaturated soils. Apply by following labeling instructions.	Criteria will prevent nitrogen spike event into water. Only high concentrations from spills are potentially toxic to fish.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Not Likely To Adversely Affect	No criteria.	No potential adverse affect outside the RHCA.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Cultural Control
Work Element:	Injection/cut stump

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>No application of injection herbicides within 25 feet of stream channel.</p> <p>No application of herbicides within or adjacent to roadside ditches or other possible pathways to water (eg. irrigation ditches).</p> <p>Herbicide application will be designed and implemented to avoid introduction into live water.</p>	The buffer will insure protection of stream bank stability and prevent contamination of live water with herbicide.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality, take, channel morphology and habitat elements	Not Likely To Adversely Affect	No criteria.	RHCAs, by definition, provide an adequate buffer for filtering sediments and chemicals.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Cultural Control
Work Element:	Mulch - by hand or machine

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs within RHCAs, in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	Potentially Adverse	Avoid hydro-mulch within 1 site-potential tree height or 100 feet of stream. Hand planting only. No aerial seeding if mixed with any chemicals, such as fertilizers.	Avoiding direct application of mulch to the stream avoids adding sediment, nutrients, and increasing turbidity.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Turbidity and suspended sediment	No Effect	No criteria.	The RHCA is an adequate buffer.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Cultural Control
Work Element:	Use grazing to control weeds, fencing or herding

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No grazing allowed in RHCAs for biological control.	Criteria is sufficient to avoid potential adverse affects (see Attachment 2 , livestock grazing).	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	For grazing after area has been burned - Livestock grazing will be excluded from prescribed burn units for a time period previously agreed upon during consultation, or a time period which would allow the vegetation to regeneration to a stage that can withstand grazing effects sufficiently to achieve and maintain natural rates of surface erosion. In no case shall either of the above time period be less than two years.	Grazing for biological control outside of the RHCA does not pose a risk for salmonids.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Herbicide Control
Work Element:	Aerial application by fixed wing or helicopter

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	<p>The complexity of this action within RHCAs requires local consultation.</p> <p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, and may be mediated by site specific landscape and climatic conditions.</p>	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	<p>The complexity of this action requires local consultation.</p> <p>For programmatic application of this action, the complexity of the activity requires extreme precautions, and may be mediated by site specific landscape and climatic conditions.</p>	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

at-risk fish or their occupied habitats.

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Herbicide Control
Work Element:	All except where otherwise noted
This Work Element includes: • Hand crank granular spreader • Liquid application • Spray from ATV • Granular Application • Back packsprayer with spray wand • Spray from truck mounted boom or spray • Hand controlled wand with soaked wick	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria.	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	No criteria	Consult locally. The complexity of this activity requires knowledge of site specific conditions and project design.	Potentially Adverse
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No Criteria.	No at risk salmonids and/or habitat present.	No Effect

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Conservation Recommendation</i>	<i>Rationale</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	<p>Use the Herbicide Risk Assessments (2002) to develop BAs. (Consider using the following criteria to achieve a negligible effect: No application of herbicides, except: use only wipers for herbicide application within RHCAs. Restricted to the following herbicides: Rodeo. Within 15 feet of live waters or shallow water table, the only herbicide authorized is Rodeo, without surfactants.</p> <p>Equipment used for transportation, storage, or application of chemicals shall be maintained in a leak proof condition.</p> <p>No herbicide storage, mixing or post-application cleaning would be authorized within the RHCA.</p> <p>Trained personnel would monitor weather conditions at spray sites during application.</p> <ul style="list-style-type: none"> ●All herbicide labels would be strictly enforced ●No broadcast spraying would occur when wind velocity exceeds 5 miles per hour within 100 feet of open water. ●No broadcast spraying would occur when wind velocity exceeds 8 miles per hour. ●No spraying would occur if precipitation is occurring or is imminent (within 24 hours). ●No spraying would occur if air turbulence were sufficient to affect the normal spray pattern.) 	<p>For programmatic application of this action in RHCAs, the complexity of the activity requires extreme precautions, thus the need to restrict method and types of herbicide application.</p> <p>See Attachment 4 (Glyphosate Risk Assessment & Noxious Weed Risk Assessment).</p>

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Information
Work Element:	Education/outreach

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	No Effect	No criteria.	These activities do not pose the potential for adverse affect to at-risk salmonids.	No Effect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Manual Control
Work Element:	Hand clip seed heads or pull weeds

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water Quality and Habitat	Potentially Adverse	No fueling of equipment within RHCAs.	Criteria are sufficient to avoid potential adverse affects because design measures avoid sediment delivery (see Attachment 2).	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Mechanical Control/Restoration
Work Element:	All except where otherwise noted
This Work Element includes: • Weed whacker use • Plowing – transport of heavy equipment • Mowing of weeds • Drill seeding • Aerial application of seeds	

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in RHCAs in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	<p>No plowing within the RHCA.</p> <p>Mowing will be conducted to avoid adverse effects to streambanks and riparian vegetation and significant effects to streamside shade.</p> <p>No mowing within 100 feet or 1 site-potential tree height (whichever is greater) from the stream channel. (see Attachment 2 – Extent of effect for stream side disturbances).</p> <p>For drill seeding, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Seeding-disking, drilling, fertilizing and plowing Work Element</p> <p>For Aerial Application of Seed, SEE: Range Infrastructure Activity Type; Rangeland Restoration Activity Component; Seeding - Aerial Work Element.</p>	The buffer is designed to avoid potential sediment transport and reduced rooting strength of riparian vegetation adjacent to streams.	Not Likely to Adversely Affect
The action occurs outside the RHCA in watersheds with at-risk fish species or with designated critical habitat or unoccupied habitat critical to species recovery.	Water quality and habitat elements	Potentially Adverse	The timing of plowing would be limited to mid-late summer when intermittent stream channels are normally dry.	The RHCA is adequate to buffer the potential for sediment transport to streams.	Not Likely to Adversely Affect
The action occurs in watersheds	Water quality and	No Effect	No criteria.	No at risk salmonids and/or	No Effect

without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and affect at-risk fish or their occupied habitats.

habitat elements

habitat present.

Species Code:	Salmonids
Activity Type:	Weeds and Chemical Treatments
Activity Component:	Weed prevention
Work Element:	Wash vehicles, water drafting

<i>Conditional Statement</i>	<i>Effects Pathway</i>	<i>Potential Effect</i>	<i>Project Criteria</i>	<i>Rationale</i>	<i>Final Effect</i>
The action occurs in watersheds with at-risk fish species, or with designated critical habitat or unoccupied habitat critical to species recovery.	Water Quality and Habitat	Potentially Adverse	<p>No vehicle washing within RHCAs.</p> <p>The determination of whether the pumping activity would occur in streams with at-risk fish, will require fisheries biologist review.</p> <p>Water drafting/pumping will maintain a continuous surface flow of the stream, without altering the original wetted width.</p> <p>Follow the National Marine Fisheries Service guidelines for screening pump intakes (May 1996: Juvenile Fish Screen Criteria for Pump Intakes).</p>	Criteria are sufficient to avoid potential adverse affects by preventing the potential for any contaminants to enter waterways.	Not Likely to Adversely Affect
The action occurs in watersheds without at-risk fish species or with no designated critical habitat or unoccupied habitat critical to species recovery. Criteria applied using this conditional statement assume that activity effects inside these watersheds would not be transferred downstream and effect at-risk fish or their occupied habitats.	Water quality and habitat elements	No Effect	No criteria.	No at risk salmonids and/or habitat present.	No Effect

ACTIVITY TYPE

Abandoned Mine Restoration

Restoration requires implementation of work activities and elements that will render an abandoned mine safe for human health and environmental function. Hard rock abandoned mines and mills typically have several features that pose a risk to human health, safety, and the environment. These include waste rock dumps and tailings that contain and release hazardous substances such as lead, arsenic, copper, zinc and other metals. Mine and mill sites may also have abandoned hazardous chemicals that were used to extract metals. Safety problems include hazardous mine openings (shafts and adits), unstable slopes on open pits, unstable buildings and other abandoned mining equipment. Dredge piles and tailings from abandoned placer mines can be major sources sediment and have the potential to have mercury contamination.

Pre-construction activities include assessments, inventories and site investigations to determine if mine features such as waste rock dumps and tailings have a release or threat of a release of a hazardous substance. If there is a release or threat of release of a hazardous substance, the Forest Service uses the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, as defined in the National Contingency Plan, for documenting, designing and reclamation of sites. Reclamation of Non-CERCLA sites follow the NEPA process. Mine and mill wastes containing CERCLA hazardous materials are typically removed and placed in an engineered on-site repository or are treated and reclaimed in place. Non-CERCLA mine features, such as placer tailings, are typically stabilized to prevent erosion. Mine openings are closed in a variety of ways depending on the site's location, environmental features, and concerns for other resources. Other actions may include restoring hydrological function and stream channels, and re-vegetating areas.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Related work elements may be found in **Access and Equipment Maintenance Activity Type** regarding access and heavy equipment use and maintenance. Almost all of the work elements associated with abandoned restoration requires the use of heavy and mechanized equipment. Related work elements may be found in **Roads and Roads Maintenance Activity Type** regarding Roads and Roads maintenance that may be needed for abandoned mine restoration. Related work elements may be found in **Prescribed Fire Activity Type** regarding camping that may be needed for abandoned mine restoration.

Mining Waste Cleanup

Abandoned mines features, such as waste rock dumps or mill tailings may contain hazardous substances as defined by CERCLA. Leachate produced from waste rock and tailings may contaminate soils and streams. Waste rock dumps, mill tailings and contaminated soils are typically excavated and removed to an on-site engineered repository. Repositories are typically excavated in a geologically suitable area and may or may not have a bottom liner. The repositories are typically capped using a geosynthetic clay liner and soil cover to minimize

rainwater and snow melt infiltration. Restoration consists of standardized practices that include the following activity components and their associated work elements:

Junk Removal - Mining waste cleanup may require removal of non-hazardous wastes in the form of wood, metals, household junk, and other trash left at the site after the mining operations ceased. These wastes can be collected and transported to a landfill.

Preliminary Assessments, Inventories, Analyses (e.g., Site Investigations, Engineering Evaluation/Cost Analysis and Design) - Assessments, inventories, and site investigations of abandoned mines are performed to characterize and identify hazardous substances that may be present in the mining wastes and other abandoned mine features. If the site is identified as a CERCLA site, an *Engineering Evaluation/Cost Analysis and Design* is performed to determine the appropriate reclamation alternative.

Contaminated Soil Removal – Soils contaminated from leachate from mine wastes such as waste rock dumps or tailings, are typically excavated and removed to an on-site engineered repository. Repositories are typically excavated in a geologically suitable area and may or may not have a bottom liner. The repositories are typically capped using a geosynthetic clay liner and soil cover to minimize rainwater and snow melt infiltration.

Barrel Removal - Sampling may be required to determine the presence and identify of hazardous substances within abandoned barrels/drums. If hazardous substances are present, removal typically involves over-packing the barrel in a larger, plastic drum. Barrels are then removed from the site to an appropriate disposal site.

Reclamation Plan Implementation – This includes the implementation of the prepared reclamation plan and design. It may require all of a combination of all of the work elements included within this activity type.

Mine Site/Abandoned Mine Reclamation

Abandoned mines may have mill tailings (crushed ore waste piles) left over from the extraction of desired economic minerals. Prior to regulation, tailings were typically disposed into streams or drainage ways adjacent to the mill. Typical reclamation includes excavation of tailings and contaminated soil and placed in an engineered repository. The stream is then reconstructed to as near as natural conditions as feasible.

Related work elements may be found in **Roads and Roads Maintenance Activity Type** regarding Roads and Roads maintenance that may be needed for abandoned mine sites.

Restore Surface Flow/Floodplain Reclamation - Reclamation includes excavation of tailings or waste rock possible reestablishment of water flow into historic floodplains, replacing cover soils, and re-vegetation with appropriate native species.

Mine Shaft Backfilling – If bat habitat is not an issue, mine shafts are typically backfilled using non-contaminated local materials. Use of polyurethane foam is commonly used in remote areas.

If the shaft cannot be effectively backfilled, an engineered plug is often used to close the opening.

Removal Of Hazardous Waste (Hazmat) – The removal of Hazmat materials and garbage removal is consistent with **Mining Waste Clean-Up Activity Component** described above. Typical reclamation includes excavation of tailings and contaminated soil and placement in an engineered repository.

Close Mine Openings, Adits, and Stopes - Gates, Foam Sealant, Backfilling, Blasting – This is the process of physically blocking an opening used for mining operations leading underground. Mine openings may be closed with bat-friendly gates if the mine has bat habitat, or the closure can be completely blocked with the use of a *foam sealant*, or *backfill* (see *Mine Shaft Backfilling* above). Explosives may be used to *blast* surrounding rock to create a rock fall in front of the opening.

Wetlands Reclamation - Remove Contaminated Soil - Soils that are contaminated from leachate from mine wastes, such as waste rock dumps or tailings, are typically excavated and removed to an on-site engineered repository. Repositories are typically excavated in a geologically suitable area and may or may not have a bottom liner. The repositories are typically capped using a geosynthetic clay liner and soil cover to minimize rainwater and snow melt infiltration. Reclamation also includes re-vegetation with appropriate native species.

Wetlands Reclamation - Restore Stream Channel –Large surface mining operations, placer mining activities, and the dumping of waste rock or tailings from hardrock mining can alter stream channels. To restore proper channel flow, mining wastes are typically excavated and removed from the stream channel. Wastes that contain hazardous substances are placed in an engineered repository. Non-hazardous wastes are typically reshaped and used for stream reconstruction. The stream channel is reconstructed with design features to ensure a properly functioning stream system.

Wetlands Reclamation – Construct Repository - Repositories are typically not located in wetlands. Repositories are typically excavated in a geologically suitable area and may or may not have a bottom liner. The repositories are typically capped using a geosynthetic clay liner and soil cover to minimize rainwater and snow melt infiltration.

Tailings Impoundment Rehabilitation - Water Management - Rehabilitation by stabilization of large, constructed tailings piles that were formed like a reservoir; a dam is placed at the lower end, with tailings flowing out in the form of slurry behind the dam. Reclamation of tailings dams includes stabilizing existing dam features or replacing features to within acceptable risk factors, reshaping, stabilizing and capping the tailings in place, and complete excavation of tailings to an engineered repository.

Tailings Impoundment Rehabilitation - Cap Impoundment – This typically includes reshaping piles, installation of water management system, and placing a cap that includes cover soil and may include an impermeable liner.

Dredge Tailings Restoration - Aerial surveys (including Photography and Hydrologic Analysis) – Determination of the extent of dredge tailings piles from placer mining and analysis of the original stream functions.

Dredge Tailings Restoration - Tailings Redistribution - Redistribution of dredge tailings from placer mining, according to plans, is a major activity associated with this type of restoration. This activity is used to stabilize large, undulating piles of unsorted cobbles, gravels, and rocks usually found in, and adjacent to old stream channels left from large floating dredges used for gold mining.

Dredge Tailings Restoration - Restore Channel Flow – Large surface mining operations, placer mining activities, and the dumping of waste rock or tailings from hardrock mining can alter stream channels. To restore proper channel flow, placer tailings are typically excavated and removed from the stream channel and may be reshaped and used for stream reconstruction. The stream channel is reconstructed with design features to ensure a properly functioning stream system

Groundwater Control - Reroute - Rerouting contaminated surface waters through a water treatment facility, either active or passive, can mitigate further groundwater contamination, or prevent possible contamination if none currently exists.

Groundwater Control - Treat - Treatment can include capturing the contaminated ground water through trenching or drilling and then installing above ground facilities to treat the contaminated water. Another method includes the installation of reactive barriers to remediate contaminated ground water by removing the toxic materials. This usually involves construction of a trench in the path of the groundwater and filling it with reactive materials (e.g., carbon-based materials, such as horse manure, that extract toxic metals).

Groundwater Control - Test - Groundwater must be *investigated* that includes sampling and chemical analysis and geohydrologic analysis to determine extent of any contamination.

Mine Waste Dump Removal - Treat – Perform a site investigation of the waste rock to characterize and identify hazardous substances that may be present. If the site is identified as a CERCLA site, an *Engineering Evaluation/Cost Analysis and Design* is performed to determine the appropriate reclamation alternative. Reclamation alternatives include removal of waste rock and associated contaminated soils to an engineered repository and reclaiming in place by stabilizing waste piles, treating waste rock, placing cover soil, and re-vegetating using appropriate native species. Non-CERCLA waste rock dumps are typically reclaimed to prevent erosion of the material.

Mine Waste Dump Removal – Test – Removal involves first testing materials to determine if contents are hazardous.

Mine Waste Dump Removal - Inventory and Monitor (including Preliminary Assessments) – Abandoned mine site inventories and preliminary assessments provide information to begin

prioritization of projects. Where advantageous, AML watershed characterizations are performed to assess the AML impacts to a watershed, to determine each mine's contribution to the impacts, and to assess and perform monitoring activities. Monitoring activities begin prior to abandoned mine reclamation and continue for several years after reclamation.

Mine Waste Dump Removal - Re-vegetation – GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component, *Seeding – aerial Work Element*** for a description of aerial seeding. GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component, *Seeding – disking, drilling, fertilizing, plowing Work Element*** for a description of non-aerial seeding. GO TO **Reforestation Activity Type, Hand plant upland/riparian Activity Component, *Plant trees and shrubs with hoe, bar, auger Work Element*** for a description of planting trees and shrubs. Other activities covered by this Work Element are described as follows: Re-vegetation is a component for most reclamation activities. Typically, cover soil is placed over excavated areas or placed or mixed in with treated wastes/soils. These areas are seeded and/or planted with appropriate native species. See **Weeds and Chemical Treatments Activity Type** for additional information concerning re-vegetation activities.

ACTIVITY TYPE: Access and Equipment Maintenance

ACTIVITY COMPONENTS AND WORK ELEMENTS

Access to Work Site

All activity types require some form of access to the work site and travel within the site. Access refers to mobilizing work crews, and the delivery and hauling of equipment, materials, and supplies needed to carry out the activity components and their associated work elements.

Access by Foot or Pack Animal - Access and mobilization to reach and maneuver around the work site would be accomplished on foot, or with pack animals (e.g., horses, mules, llamas and even goats). Pack animals or travel by foot may be needed to access areas that cannot physically be accessed by a road system or by mechanized vehicles. These areas may include but are not limited to, wilderness and roadless areas, areas with seasonal or year round access restrictions (e.g., wildlife concerns), or watersheds with erosive or unstable soils. Roads often have seasonal closures to protect lambing and calving, or during wet periods when roads are subject to damage by erosion. Pack animals and travel by foot can only be used, however, when the work activity does not require the use of heavy equipment or large quantities of material (e.g., fencing supplies, gravel, soil, or large structures).

Access by Vehicle on Roads, within Normal Use Patterns – Access by vehicles within normal use patterns may include travel with passenger vehicles (for crews); all terrain vehicles (ATVs); snowmobiles and other over-the-snow machinery; large and small sized trucks; and trucks hauling heavy machinery, logs, or other materials that require the use of a dump truck (e.g., soil, gravel, poles, or any number of other supplies). Vehicular use on system roads and designated off road areas would generate expected and more predictable levels of disturbance or risk to

other resources.

Access by Vehicle or ATV Off Roads or Outside of Normal Use Patterns – All of the mechanized vehicles mentioned in the previous Work Element may be used under this activity as well. This type of travel includes travel on closed roads, travel off of designated roads and trails, and use of roads and trails outside of normal restrictions. The frequency, duration and level of disturbance generated from mechanized vehicle, heavy equipment and power tools outside of what is considered normal, may cause erratic, continuous, or higher levels of disturbance and increased damage to certain resources. For example, travel off-roads and onto undesignated trails or areas with no trails, may alter normal wildlife use patterns, increase soil erosion and compaction in susceptible areas (e.g., wet meadows, streams, or sensitive plant communities), or spread weeds into previously unoccupied areas.

Work activities during fire suppression, prescribed fire, or any other work activity related to rehabilitation may need to occur outside of normal use patterns. In some cases, salvage efforts post fire may require access and associated road or off road use for long periods of time, may require higher numbers of log hauling trucks, larger crews, or road maintenance (e.g., grading and dust management) at high frequency intervals.

Rangeland rehabilitation efforts may require off-road access, larger crews and the hauling of materials to rebuild fences or water developments.

Access by helicopter/aircraft – Some work sites or distribution points may need to be accessed by helicopter or aircraft for transporting crews, aircraft equipment, materials and supplies. Aerial access may occur for any number of reasons including emergency situations and the immediacy of work needed, or the sites location relative to roads or trails. No construction of new landing strips for fixed-wing aircraft would occur.

Fueling/Maintenance

Vehicles used to travel to worksites, and heavy equipment and power tools used at worksites may need re-fueling and maintenance throughout the duration of the work activities. It is not always practical or possible to re-fuel and conduct maintenance at a development such as a warehouse.

Fueling/maintenance of Light Equipment on Site - Chain saws, augers, and other lighter power tools can be refueled and serviced at the site with little to no risk to other resources.

Fueling/maintenance of Heavy Equipment on Site – Bulldozers, graders, backhoes and other heavy machinery and equipment will need re-fueling and maintenance during work activities, and it may not always be practical to do this at a development such as a warehouse. Heavy equipment may require the use of high volumes of fuel, and repair and maintenance may be frequent. The risk of spilling substantial amounts of fuel or cleaning substances, and/or accidental release of other toxic substances, may increase.

Normally, a site is designated where these activities can safely occur. Sometimes it may not

always be possible to reach these sites if equipment runs out of fuel or if equipment fails and needs immediate repair. In all circumstances certain habitats should be avoided, including wetlands, streamside riparian areas and habitats with sensitive plants, to name a few.

ACTIVITY TYPE: **Defensible Space**

Defensible space is an area, typically 30 to 120 feet wide that lies between improved property with human structures, and potential wildland fire areas. It is within this space that combustible materials are removed or modified making them safer for fire operations to defend and protect the structures.

The threat to life and property from wildfire is a significant issue for federal, state, and local fire planning agencies responsible for protecting residential areas (and their associated structures) in close proximity to wildlands. This issue is currently at the forefront of fire management and protection policies at national and local levels. Areas determined susceptible to threat of wildland fire are called wildland-urban interfaces (WUI).

The WUI consists of areas with human populations and structures, as well as other areas of special significance that lie within or adjacent to wildland areas. Developed areas on private, state and federal lands that may need fuel reduction treatments include but are **not** limited to: private residences, recreation and business centers, campgrounds, communication towers, high voltage transmission lines, church camps, scout camps, research facilities, summer homes or ranger stations, ranches, outbuildings, and municipal watersheds.

Treatments that may be used to reduce the risk of wildland fire or create defensible space are not limited in application to communities, private residences, or other private structures. These treatment applications may be implemented for any public facility or structure, or area of special significance that occurs on state or federal lands.

Related work elements may be found in: **Mechanical Treatments Activity Type** regarding tree felling, hazard tree removal, thinning, and piling; **Prescribed Fire Activity Type** regarding fire and camping; **Reforestation Activity Type** regarding planting; **Weeds and Chemical Treatments Activity Type** regarding weeds; and **Access and Equipment Maintenance Activity Type** regarding access and fueling issues.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Fuels Reduction

Remove Plants or Plant Parts – The removal and/or reduction of flammable plants and plant parts such as dead trees, branches, flammable brush, grasses and leaves is a common practice. Fuels reduction treatments may include under or overstory thinning, selective tree harvest or complete removal of dense forest stands. Other important treatments include pruning dead wood from shrubs, removing low tree branches, mowing dried grass, and/or piling brush and down trees for removal or subsequent burning under safe conditions.

Replace Flammable Plants with Less Flammable Plants – An example of this work element is replacing highly flammable shrubs with irrigated and well-maintained flowerbeds and lawns.

Structure Modifications

Structures would include homes and their associated buildings, developments and structures within administrative sites, or any others that may or may not be listed above.

Replace Flammable Roof Materials – Replace flammable roof materials (e.g., cedar shingles) with “Class C” fire resistant roofing (metal or asphalt) or better.

Remove Ignitable Materials Surrounding Structures – Some examples include: removing ignitable materials from around chimneys, within gutters, off sidewalks or any other home, lawn, or structural features and attachments that may collect ignitable materials.

ACTIVITY TYPE: Forest Products

Activities include collection and gathering of products other than those related to mineral or saw-timber removal operations. All activities require collection permits whether for personal or commercial uses. Activity levels vary from minimal, to potentially disturbing, depending on the density and collection locations across a unit. Activities may require the use of heavy equipment and power tools as well as off-road travel and/or increased access to previously undisturbed sites. These activities will not require new road construction or reconstruction, but in rare circumstances, opening a closed road may be needed. Related Work Elements may be found in **Mechanical Treatments Activity Type** regarding felling, thinning and hazard trees, **Access and Equipment Maintenance Activity Type** regarding access and fueling, **Prescribed Fire Activity Type** regarding fire and camping, and **Defensible Space Activity Type**.

To manage activities of potentially high densities of people and to minimize resource damage, appropriate campsites and sanitation facilities must be provided. Soil and plant compaction, and/or road closure violations may occur. Campers located near water sources should be kept from having an impact on riparian areas, fish and efforts made to minimize potential effects to listed species such as bald eagles. Proper camp location, law enforcement involvement, and education should help avoid any adverse effects.

ACTIVITY TYPES AND WORK COMPONENTS

Firewood Collection

Collect Firewood from Already Downed Sources (e.g., hazard tree removal, road maintenance, etc.) - Firewood collection may require the use of heavy equipment. Access and hauling activities may pose concerns. Firewood collection for both personal and commercial use will require a permit. Although commercial operations are managed, personal collection may or may not be managed, depending on the geographic area. Personal firewood permits allow for the collection of ten cords of wood per year / per person. These cords may be sold under one or

more permits. The number of cords of wood allowed for collection under a commercial permit will vary by administering unit. The amount of woody material taken from a site should not exceed amounts required by the administering units' standards and guidelines for dead and down material. See the **Access and Equipment Maintenance** and **Roads and Roads Maintenance Activity Types** for additional information

Fruits, Berries and Nut Harvest

Hand Picking and Raking of Edible Berries - Post-disturbance there may be an increase in the availability of fruits, berries, and nuts, depending upon the site, habitat type, and extent of a burn. The scope of activity is similar to that identified under mushroom harvest relative to campsites, human densities and potential resource damage apply (see **Mushroom Harvesting Activity Component** below).

Greenery Harvest – Total Removal

Digging of Species for Complete Removal – Collection of boughs, ferns, or any other plants used in ornamental commodities is allowed under permit for personal and commercial operators. No significant increase in any additional management is expected. In burned areas, no harvest is expected.

Moss Harvesting

Moss Removal – Moss collection is not expected to increase above normal levels or to occur in burned areas.

Mushroom Harvesting

Removal of Fungi - Large numbers of people can be expected, under permit, to personally or commercially harvest mushrooms such as morels, *Morchella esculenta*, in burned areas. Morels come in after disturbance and usually last three to four years each spring for approximately a three-week period.

Raking of Soil Substrate/Mycelium - Harvest techniques do not require raking for detection or collection. Therefore, soil substrate disturbance will be minimal.

Seed Collection

GO TO **Reforestation Activity Type, Collection of Plant Propagation Materials Activity Component** for a description of work elements related to collecting seed or other plant propagation materials.

Tree and Shrub Removal

Complete or Partial Removal of Trees or Shrubs - Collection of whole or partial plant parts used in ornamental commodities (e.g., scorched bark, root wads, picture frames, fence posts,

landscape design) is allowed under permit for personal and commercial operators in areas previously impacted by wildland fires. The amount of trees or shrubs removed would be small and scattered in nature. See the **Mechanical Treatments Activity Type** for additional information.

Public Access

Public Access - See the **Access and Equipment Maintenance Activity Type** for implementation information

ACTIVITY TYPE: Insect and Disease Suppression

ACTIVITY COMPONENTS AND WORK ELEMENTS

These projects cover a wide variety of insect and disease prevention and suppression activities. Insects and diseases can increase stand flammability by causing mortality and increasing slash. In addition to increased mortality, dwarf mistletoe infestations increase stand flammability by creating ladder fuels. Some of the work elements that have primary objectives covered by other activity types and components are not detailed here (e.g., reforestation; thinning of forested stands; prescribed fire).

Related Work Elements may be found in: **Mechanical Treatments Activity Type** for felling, thinning, and hazard trees; **Roads and Roads Maintenance Activity Type** for snowplowing; **Prescribed Fire Activity Type** for fire and camping; **Reforestation Activity Type** for planting; and **Access and Equipment Maintenance Activity Type** for access and fueling activities.

Aerial Survey and Application of Insecticides and Pesticides

Aerial surveys are used to determine status, extent, and intensity of defoliation or mortality from insects, diseases, or other agents (i.e. bear damage).

Fixed Wing/Helicopter Flights and Application less than 1500 feet above ground – Special surveys that require close inspection by helicopters are typically conducted 100 to 500 feet above treetops. Fixed wing aircraft or helicopters flying within 50 feet of the treetops and in swaths of about 150 feet apply insecticide. Only Environmental Protection Agency (EPA) approved insecticides are used and all applications follow label directions and precautions. Mitigating actions required by an Environmental Assessment (NEPA document), or Record of Decision (ROD), are included in the contract. Bulk tankers transport insecticide over forest roads. Water, if needed, is pumped from rivers or streams (see the Prescribed Fire Type for water drafting and water pumping).

Fixed Wing/Helicopter Flights and Application greater than 1500 feet above ground - Fixed wing flights are typically conducted about 1,500 feet above treetops, traversing the area in a grid with 4-mile wide swaths, or by contour flying in deeply dissected terrain.

Fertilization

Hand Application of N-Frells - Fertilization can enhance stand vigor and promote resistance to insect and disease-related mortality, and subsequent risk of fire. Nitrogenous compounds in the form of pellets (*N Pellets*) or frells (*N Frells*) can be applied by hand using a hand-crank fertilizer spreader.

Ground Applications of Pesticides

Back-pack Spraying or Inoculation of Individual Trees with Insecticide – Insecticide is applied to protect individual high-value trees using backpack or hydraulic sprayers. Only EPA registered insecticides are used and all applications follow label directions and precautions. Mitigating actions required by the NEPA document or Record of Decision (ROD), are included in the contract. Insecticide in small quantities (less than 50 gallons) is transported by small truck to the treatment sites. Occasionally, implants of a systemic insecticide are placed by hand into individual trees.

Borax Treatment of Freshly Cut Stumps - To prevent the spread of annosus root disease, large freshly cut stumps are covered with a thin film of borax powder to prevent germination of *Heterobasidion annosum* spores. Borax may be applied manually or mechanically, using an attachment to the felling equipment.

Ground Survey

Walking Survey - Walking surveys are used to determine status of insects and diseases, or to “hazard rate” stands to identify those susceptible to insects or diseases before and after fire. A survey of stands is conducted in a manner similar to a forest inventory. One or two people traverse stands and take non-destructive measurements of the vegetation and site. Occasionally roots or boles are chopped to detect or verify insects or diseases. Some surveys establish semi-permanent plots. These surveys are conducted where areas are fully accessible on foot. See the **Access and Equipment Maintenance Activity Type, Access to work site Activity Component** for additional information.

Manual Treatments

Manual and mechanical treatments (see **Mechanical Treatments Activity Component** below) reduce stand susceptibility to insect and disease-caused mortality and consequently reduce fire risk. Treatments reduce stand density, remove infested trees, remove trees at high risk of becoming infected (for example scorched trees), alter stand structure, or convert stands to less susceptible species. Slash disposal prevents bark beetle build-up in downed material. For treatment to be effective against bark beetles, most of the material larger than about 4” in diameter must be physically removed from the site, debarked, cut into smaller pieces, chipped, or burned, before beetle flight.

Thin, Selecting Against Species/Conditions – Manually thinning involves a crew using chainsaws to cut undesirable trees close to the ground. Susceptible species and trees infected with dwarf

mistletoe, western gall rust, or other insects or diseases are selected against. GO TO the **Mechanical Treatments Activity Type, Harvest Prescription/Implementation Activity Component, Understory / single story treatments: thinning Work Element** for the description of this Work Element.

Burning Infested Tree - Individually infested trees can be burned in place. Slash can also be burned in place, or pushed into piles with large rubber-tired or tracked tractors, and burned (*machine pile and burning*). See **Mechanical Treatments Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component**, and **Prescribed Fire Activity Type** for additional work elements used to accomplish these objectives.

Topping or Otherwise Killing, and Removing Infested Trees - Individual trees can be burned in place, or the tops may be removed to kill the tree. Treetops are removed with a chain saw, or by setting an explosive charge below the live crown. Girdling, cutting off the bark and cambium in a strip 4 inches wide all the way around the tree, is less reliable.

Slash Disposal, Lop and Scatter, Pile or Cover Hand Pile and Burn - Disposing of slash helps prevent bark beetle build-up in downed material. Manual slash disposal requires cutting slash into smaller pieces and scattering them on the ground (lop and scatter), or putting the pieces in piles not more than approximately 6 feet high. Piles may be placed in the sun and covered with transparent plastic to kill any bark beetles (pile and cover), or burned (pile and burn). Slash can also be broadcast burned in place. See the **Prescribed Fire Activity Type** and **Mechanical Treatments Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component** for additional work elements used to conduct these activities.

Pruning - In some cases, dwarf mistletoe brooms can be pruned from the lower crown to increase tree vigor and/or reduce a safety hazard. Pruning also reduces white pine blister rust infection and mortality. Pruning is usually done with a chain saw or pole-pruner and pruned branches are lopped and scattered on the ground.

Mechanical Treatments

Also, see general description in **Manual Treatments Activity Component**, above.

Slash Disposal Debark/Chip/ or Fragment, Machine Pile, and Burn - Disposing of slash helps prevent bark beetle build-up in downed material. For treatments to be effective against bark beetle outbreaks, most of the material must be reduced to less than about 4 inches in diameter. Slash can be chipped and spread around the site. Slash can also be burned in place, or pushed into piles with large rubber-tired or tracked tractors, and burned. Large logs can be debarked by machine. See **Prescribed Fire Activity Type** and **Mechanical Treatments Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component** for additional work elements used to conduct these activities

Young Stand Destruction, Chaining, Roller Chopping – Where a young stand has become heavily infected and stand management objectives will not be met, stand destruction can be accomplished by chaining, roller chopping, or manual whip felling. Chaining and roller

chopping require the use and transportation of heavy equipment. Chaining requires two bulldozers moving together over the stand with a heavy chain stretched between them; the chain knocks down and pulls up the young trees. Roller chopping is done with a bulldozer pulling a large rolling drum over the stand. The drum has protruding flanges to aid in cutting and crushing the young trees. For added weight, the drum is filled with water (often drafted from a stream - see **Prescribed Fire Activity Type, Fireline Construction/Holding Actions Activity Component, Pumping from streams/ponds using portable pumps Work Element** and **Drafting to fill engines/tenders Work Element** for this activity) from a water tender or engine, and drained on site. Under freezing conditions, the drums may be filled with antifreeze. Slash may be lopped and scattered or burned in place. Manual whip felling involves crews using chainsaws to cut the infested trees as close to the ground as possible.

Overstory Removal – When previous partial cutting has left an overstory heavily infected with dwarf mistletoe, timely overstory removal prevents infestation of the young understory. Overstory removal can be accomplished mechanically. Felled trees can be removed or left on site with appropriate slash disposal. GO TO **Mechanical Treatments Activity Type, Harvest Prescription/Implementation Activity Component, *Overstory treatments: Overstory removal, partial overstory removal, sanitation* Work Element** for the description of this work element.

Harvest/Removal of Fire Damaged or Other High Risk Trees – Fire killed or heavily damaged trees, trees infected with mistletoe, or trees with extensive decay may be a safety hazard to vehicles on roads, to a campsite, parking area, or building. Such trees are typically felled by chainsaw, and subsequently removed or left on site with appropriate slash disposal. An old dense, heavily damaged or heavily infested stand may not be capable of meeting management objectives, or it may be a fire risk. Regeneration harvest can return a forest stand to dominance by seral species that are less susceptible to some insects and diseases. Regeneration harvest is designed to completely replace a stand by clearcut, seed tree or shelterwood cut. Seed tree and shelterwood cuts require multiple entries before the old stand is completely removed from the newly regenerated stand. See the **Mechanical Treatments Activity Type, Harvest Prescription/Implementation Activity Component** for additional details and work element descriptions.

Thin, Selecting Against Species/Conditions - Thinning from below and thinning with selection against certain species or conditions, reduces stand density and alters stand structure and composition. This reduces the stands susceptibility to insects and disease. Mechanical thinning requires the use of heavy equipment and power tools. GO TO **Mechanical Treatments Activity Type, Harvest Prescription/Implementation Activity Component, *Understory/single story treatments: thinning* Work Element** for the description of this Work Element.

Plant Less-Susceptible Species

Many insects and diseases are host specific or preferentially attack certain kinds of trees. The dwarf mistletoes and some bark beetles have limited host ranges. Climax species tend to be more susceptible to root diseases. Planting less-susceptible species can ensure continuous forest vegetation conditions while other tree species are under decline. GO TO **Reforestation Activity Type, Hand Plant Upland/Riparian Activity Component** for the description of this work

element.

Population Assessment and Trapping

In some instances, population assessments are conducted prior to the roads being passable because of snow. In these cases, roads must be plowed to gain access to remote areas requiring analyses. For some insects, the placement of bubble caps (see below), may be done over snow. In these situations, roads may need to be plowed or travel with snow machines may be necessary. See the **Access and Equipment Maintenance, Roads and Roads Maintenance, and Mechanical Treatments Activity Types** for work elements related to snowplowing, over the snow travel or other associated activities.

Sampling and Trapping - Population assessment of defoliators is sometimes done over a large landscape to determine if populations warrant suppression. Larval populations are sampled prior to application of pesticides. This usually consists of clipping 18-inch branch tips and counting larvae. Larvae can also be sampled by beating the lower branches of a crown; this dislodges the larvae onto a canvas where they are counted. For cocoon and/or egg mass sampling, visual observations are made of the lower crown of trees, or lower branches are cut and examined. Adult populations of defoliating insects are sampled using pheromone-baited traps placed in accessible areas to catch flying males.

Use of Fire

Prescribed underburning can accomplish some of the same objectives as thinning from below, thinning with selection against certain species, and young stand destruction. See the **Prescribed Fire Activity Type** for related work elements.

Pulling back duff from legacy trees - Large legacy trees may be protected from bark beetle attack by removing competing vegetation and pulling back duff from the base of the tree. Thick duff at the base of large trees is pulled away by hand crews using rakes or shovels. The duff is then redistributed well away from the large trees.

Use of Pheromones

Pheromone treatments may be used to collect massive numbers of beetles in baited traps or trap trees, or to disrupt the behavior of beetles to prevent their infestation of other susceptible stands.

Anti-aggregate Bubble Caps - Anti-aggregate pheromones are used to disrupt the behavior of beetles to prevent infesting susceptible stands. Pheromone bubble caps (packets containing an EPA-registered pheromone) are stapled to trees in a 10 x 10 meter grid pattern over the treatment area. After the flight period, the bubble caps are removed from the trees.

Trap Tree Baiting and Removal - Attracting and collecting massive numbers of beetles in pheromones-baited “trap trees” can reduce bark beetle populations. Trap trees are removed from the area before the next beetle flight period. When removing trap trees is infeasible, pheromone-baited traps might be effective in some instances.

ACTIVITY TYPE: Mechanical Treatments

Work elements are typical of timber harvest operations, however, implementation of certain work elements may be needed for reasons other than timber production. For example, thinning forested areas may be used to reduce fuels in the wildland-urban interface (WUI) and create “defensible space” near human developments or agency administrative sites. Most work elements in this activity type require the use of power tools, heavy equipment, and crews.

Related Work Elements may be found in: **Roads and Roads Maintenance Activity Type** regarding snow removal, opening closed roads, and road work; **Access and Equipment Maintenance Activity Type** regarding access, the use of heavy equipment, and mechanized tools; **Prescribed Fire Activity Type** regarding fire and camping; and **Weeds and Chemical Treatments Activity Type** regarding weed prevention actions.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Dust Abatement

Chemical Palliatives – For salmonids, criteria will be found under this Work Element; for all other species, criteria will be found under **Roads and Roads Maintenance Activity Type, Road Maintenance Activity Component, Dust abatement – water or chemical Work Element**. GO TO **Roads and Roads Maintenance Activity Type, Road Maintenance Activity Component, Dust abatement – water or chemical Work Element** for the description of this Work Element.

Water Drafting – GO TO **Prescribed Fire Activity Type, Fireline Construction/Holding Actions Activity Component, Drafting to fill engines/tenders Work Element** for the description of this Work Element.

Harvest Prescriptions/Implementation

Prescriptions contain rationale (or need) for treating forested habitats and identify implementation tactics needed in advance of harvest activity. For assessing potential effects of harvest treatments on certain species, activities include both the description of the treatment to be enacted and actual implementation procedures. Harvest units are either marked as leave or cut trees, designated by a diameter limit, or designated by a species for harvest in the timber sale contract.

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ACTIVITY COMPONENTS AND WORK ELEMENTS

Dust Abatement

Chemical Palliatives –GO TO **Roads and Roads Maintenance Activity Type, Road Maintenance Activity Component, *Dust abatement – water or chemical* Work Element** for the description of this Work Element.

Water Drafting – For salmonids, criteria will be found under this Work Element; for all other species, criteria will be found under **Prescribed Fire Activity Type, Fireline Construction/Holding Actions Activity Component, *Drafting to fill engines/tenders* Work Element**. GO TO **Prescribed Fire Activity Type, Fireline Construction/Holding Actions Activity Component, *Drafting to fill engines/tenders* Work Element** for the description of this Work Element.

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Regeneration Harvest: Clearcut, Seed Tree, Shelterwood - Treatments are used to create a forest stand with one or two age classes in an exposed microclimate. Treatments are most suited for shade intolerant species. *Clearcutting* removes all trees in a single harvest thereby preparing the site for planting or natural regeneration. *Seed tree* harvest removes all except a small number of seed trees to provide for regeneration. *Shelterwood* operations remove most of the trees except those needed to provide shade and/or seed for establishing a new stand.

Traditionally the shelterwood and seed trees that remain are removed once the new stand is established. However, it is now common to leave seed trees, shelterwood trees, and other designated trees as “reserve” trees, to promote forest stand diversity, and meet other resource needs. Reserve trees may comprise 40 % of a forest stand following harvest, occurring in groups or uniformly throughout the stand. Trees are managed with the developing young stand to produce a two-aged stand. During shelterwood and seed tree harvest treatments, the majority of undesirable small trees are typically slashed so they do not compete with establishing trees.

Understory/Single Story Treatments: Thinning – Thinning may occur in any age or structure of stand and involve removal of various components of the stand, depending on the purpose of the thinning. It may be applied in single-story or multi-storied stands. Thinning is a common tool for decreasing fuel in stands that are considered overstocked or as a pre-treatment for prescribed fire. In these cases, thinning often targets understory trees. Thinning is also used to break the continuity of the tree canopy to limit fire spread in the canopy. In other cases, thinning may remove some of the overstory trees to reduce competition and increase growth or to remove larger trees when they overtopped, malformed, or otherwise are undesirable dominants.

Overstory Treatments: Overstory Removal, Partial Overstory Removal, Sanitation - In uneven-aged forest stands, all or some portion of the larger, dominant trees in the overstory may be removed leaving the understory trees intact. This is referred to as partial or complete overstory removal. This can be accomplished by selective tree and group harvest procedures. Sanitation cutting removes dead, diseased and damaged trees, or those live trees susceptible to the actual or anticipated spread of pests and/or pathogens. This treatment is used to promote forest growth and health. The liberation method removes trees that are overtopping young trees in the sapling stage. The improvement method is similar to commercial thinning where less desirable trees are removed to improve stand composition and quality. A timber sale contract refers to these systems as commercial thin and overstory removals.

Dead Trees: Salvage, Hazard Tree Removal – Salvaging dead and dying trees or deteriorating stands typically occurs before the wood becomes economically unfeasible to harvest. When all or nearly all of the trees in a stand are dead, a regeneration system is prescribed. When a small portion of the stand is dead, a salvage operation is prescribed that leaves residual live trees. Salvage operations are the most common treatments used in areas to remove dying and damaged trees following fire, insect or pathogen outbreaks, or weather related events such as winterkill. Hazard trees occur in a variety of situations and result from several disturbances, such as fire, insects, pathogens, age, or human-caused injuries. Hazard trees are removed when they pose a risk to campsites, administrative sites, along roadways or other areas where the trees pose a danger to the public. Hazard trees also pose a danger to the health and welfare of people at the sites. These trees may be obstacles to safely working equipment, or they may be snags or

weakened trees with the potential to topple during work operations. Such trees are typically felled by chainsaw, and subsequently removed or left on site with appropriate slash disposal. Removing hazard trees following fires, insect, or disease outbreaks is often done through the timber sale process or by contract.

Selection Harvest - All Stand Layers - Selection harvest is used to “regenerate”, create and retain at least three distinct age classes. Several harvest entries are made over the rotation period of the stand. Traditionally, treatments have been designed to maximize timber yield and establish a new crop of trees with an irregular species and structure constitution. Selection treatments may be designed to remove individually dispersed, and/or groups of trees. Individual tree selection is limited to the removal of shade tolerant species and no distinct openings are created.

Forest stand opening are established where groups of trees are removed. Group selection harvesting can be used on any forest type. The size of the opening is dependent on whether the primary re-vegetation species is seral (shade intolerant or semi-shade tolerant) or climax (shade tolerant). For example, openings can range from one-fourth to four acres. New trees become established in the openings and this promotes the development and maintenance of a structurally diverse forest stand. This type of treatment is suitable for both shade intolerant and shade intolerant species. Harvest entries may occur at intervals of twenty years or longer depending on the rotation life of the stand.

Killing Sub-merchantable Trees

For salmonids, criteria will be found under this Activity Component; for all other species, criteria will be found under **Tree Felling Activity Component** (below in this Activity Type) for killing trees by falling or **Prescribed Fire Activity Type** for killing trees by burning. GO TO **Tree Felling Activity Component** (below in this Activity Type) for killing trees by falling. GO TO **Prescribed Fire Activity Type** for killing trees by burning.

Logging Systems and Operations

These are mechanical methods of getting the tree/log from the harvest unit to the landing. The logging system used for stand treatment depends on harvest objectives, terrain, and concerns for other resources.

Ground Based Logging— Ground based logging systems use tractors, feller-bunchers, forwarders, and some types of cable systems. During this operation, logs are moved (skidded) more or less wholly along the ground. This type of system usually involves the creation of skid trails from the individual trees to the landing. Depending on the stand conditions and contract specifications, skid trails may occur throughout the logging unit or may be designated to specific areas. Soil disturbance along skid trails and within the stand varies from high to low depending on condition, time of operation, equipment, etc.

Helicopter – An aerial yarding operation lifts and flies logs to a landing, resulting in minimal soil disturbance. Aerial operations are used where access is limited, yarding distances are one-half mile or less, or other resource concerns must be met.

High Lead – Powered cable logging consists of main-line blocks, fastened high on a spar tree or equivalent, that enable the front end of logs to be lifted clear of the ground. Generally this system is powered by a 3-drum power-unit carrying main haul-back and straw lines. Although this logging system requires the use of heavy equipment, ground disturbance is relatively low.

Skyline – Powered cable logging is where a heavy cable, “the skyline”, is stretched between two spar-trees (or their equivalents): the head-spar, close to the landing and power unit, and the tail-spar. Spar trees function as an overhead track for a load-carrying trolley, or skyline carriage. The carriage traverses along the skyline under the control of a main-line and a haul-back line. Under some operations, logs travel clear of the ground for minimal impacts on soils. Most skyline operations do not provide for full suspension and therefore the logs would be trailed on the ground

Hauling – This is a general term for the transport of loads from one point to another, (e.g., logs from stump to landing or from landing to mill or shipping point). Logs are loaded onto a logging truck and transported on a main road designated as the haul road. Log truck travel along haul routes may have short-term impacts in the area by generating dust or creating disturbances.

Loading - Process of moving the log from a deck onto a truck (usually). The process involves heavy equipment.

Landing Construction and Location – A landing is a place where timber is assembled for further transport. Landings are generally “constructed” by clearing away existing vegetation (trees and brush), however, no soil is removed or plowed up. Logging activities often center around landings and most heavy equipment is used there. Landings must be constructed to complement the yarding system; comply with safety codes and other environmental standards; accommodate the size and type of machinery needed; and, the amount of material to be yarded.

Reducing Soil Compaction

Subsoiling – This requires the use of a machine attached to a small bulldozer to dig into the ground and uplift soil to reduce subsoil compaction caused by logging or other mechanized equipment. While this is a surface disturbing action, it provides soil that is better suited for tree establishment and water penetration.

Refueling

GO TO **Access and Equipment Maintenance Activity Type, Fueling/Maintenance Activity Component** for the description of this activity.

Rehabilitation, Removal of Excess Vegetation and Slash

After harvest, fire, or other disturbance, treatments are needed to prepare the affected site for regeneration and reduce high fuel loads. Operations should be conducted in a manner to minimize topsoil disturbance, and still maintain the desired level of woody debris on the site.

Furrowing - A dozer with a blade at an angle is used to create a furrow oriented on the horizontal. Furrowing is done to accomplish scarification on steeper slopes, and used to minimize erosion.

Patch Scarification, Mechanically or by Hand – GO TO **Reforestation Activity Type, Site Preparation Activity Component, Hand scalp/Grubbing WorkElement** for the description of hand scarification. Other activities covered by this Work Element are described as follows. Scarification is achieved with attachments to dozers which scrape the ground surface to expose mineral soil at specified distances to create planting spots. Generally, patch scarification is only used where competing vegetation is very dense. See **Reforestation Activity Type, Site Preparation Activity Component** for additional information on mechanical scarification activities.

Dozer Scarification - A bulldozer with a brush blade or similar attachment is used to rip topsoil pulling out bunch grasses or similar competing vegetation in various patterns on 20 to 40% of the unit.

Dozer Piling - Bulldozer is used to collect and pile woody material throughout the unit for later burning. Piling may also utilize rubber-tired equipment.

Grapple Piling - The grapple piler lifts fuels up and lays it in a pile. Less topsoil is disturbed in grapple piling, as opposed to dozer piling.

Hand Piling – Excess slash from a harvest or thinning operation may be piled to reduce. This process does not scarify and no soil disturbance occurs.

Piling at landings – If a cutting unit is tree-length yarded, tops and limbs are piled for later treatment, usually by burning.

Road Construction

GO TO **Roads and Roads Maintenance Activity Type, New Construction/Reconstruction Activity Component** for the description of this activity.

Road Maintenance

GO TO **Roads and Roads Maintenance Activity Type, Road Maintenance Activity Component** for the description of this activity.

Skid Trail/Landing Rehab

Waterbars – Shallow channels (cross-drains) or raised barriers (e.g., a ridge of packed earth or a thin pole), are laid diagonally across the road surface to direct water (particularly storm water) from roads and trails. This will reduce potential sediment from reaching streams, wet meadows or other moist areas of areas of concern.

Tree Felling

Hand – Standing trees are primarily cut down with hand tools such as a chainsaw (see *Mechanical* below). In wilderness areas, however, a cross cut saw is used.

Mechanical – This involves cutting down a tree with a chain saw and/or feller-buncher. A feller-buncher is a tracked vehicle with a boom and chainsaw or clippers attached to the end of the boom for cutting trees. A feller-buncher lays down a slash mat on which to operate for minimal soil disturbance. Skidding equipment also moves over slash mats built by the feller-buncher to reduce soil movement.

Additional Information for Harvest Treatments –

These are not “stand alone” work components or work elements. They are included here to help further describe the harvest prescriptions described above. These are common treatments used for the management of forested areas for timber productions.

Intermediate/Commercial Treatments - Intermediate harvest (or sometimes known as commercial thinning) is the harvest of trees in an immature stand to reduce tree numbers, and/or select for favored tree qualities. Trees are generally removed in a dispersed manner and regeneration is not the goal. These treatments promote the growth and vigor of the remaining trees, or may be used to alter the species composition of the stand. Sanitation harvest may be the goal of these operations as well. A manageable stand remains following harvest. Post and pole sales (the harvest of trees from 4 – 7 inches at diameter breast height) are generally considered intermediate operations. These treatments are also common in lodgepole pine stands and where the demand is high for fence material and other uses.

Pre-commercial Thinning/Commercial and Non-Commercial – Pre-commercial thinning generally refers to the harvest of trees ranging in diameter breast height from 1 – 4 inches. Generally, the purpose of this activity is to reduce competition among the trees in the target forest stand. Tree densities in pre-commercially thinned stands will vary from 150 to 400 trees per acre; this depends on species growth patterns and management objectives. Release thinning is similar, although generally involves the felling of trees overtopping young regeneration in a non-commercial operation. Pre-commercial thinning is typically conducted with a service contract. During periods of poor market conditions or treatments involving species with little or no market value, trees larger than 4 inches in diameter may be cut and not sold.

ACTIVITY TYPE: Prescribed Fire

Prescribed fire projects are part of vegetation manipulation projects that reduce hazardous fuels and restore natural ecosystems. Prescribed fire projects are often a combination of numerous activity types. The actual application of fire is often only a small part of the total project. Prior to ignition of the prescribed fire, other work activities must occur to prepare the project area for the fire. For example, in remote locations, camps will be established and supplied. Following

wildland and prescribed fires, rehabilitation work may be needed to mitigate impacts caused by implementation. Each project has its own special set of conditions, and its own combination of activities.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Fire Support

See the **Roads and Roads Maintenance Activity Type** for information related to road use and maintenance associated with prescribed fire activities.

Fire/Spike Camps- Some prescribed fire projects are conducted at remote locations. Personnel conducting the project must camp near the project area. The size of any particular campsite, and the complexity of the logistic support operations are determined by the magnitude of the project.

Large prescribed fire projects in remote locations may require that personnel camp near the project site. This helps to increase the amount of time spent on site, and reduces potential hazards to personnel traveling to and from the project area. This can be especially important when crews are working long hours and driving prior to sunrise and after sunset. There will be areas for tents, cooking and dining, restrooms, parking for vehicles, and sometimes for helibase/helispot activities. Logistical support of large camps often requires daily shuttles of supplies and resources. Large camps will often be placed in accessible areas with good road access.

Spike camps are often set up on less complex prescribed fire projects, or in the early stages of the project. These camps require less logistical support and will occupy a smaller total area. Small camps will have similar components to large camps but total number of personnel will be less. These camps are also set up in less accessible areas, are more self-contained and daily supply is not necessary.

Fireline Construction/Holding Actions

There are numerous techniques used to build fireline. The overall goal of fireline construction is to remove living and dead vegetation (fuel), or to create a break in the continuity of the fuel. Fuel breaks help stop fire spread. Flame lengths and fuel type are used to determine the width of a fireline.

Machine Built Fireline – This type of fireline is created using mechanized equipment. Bulldozers, tractors with plows, road graders, or even four-wheelers can be used for line construction. Machine built firelines are typically constructed on level terrain having less than a 15 % slope and relatively free of surface rocks. Machine built fireline is used when a fuel break needs to be wide and/or lengthy, or when smaller fires have the potential to rapidly grow. The ground must also be relatively free of large surface rocks. Plows, dozers, blades, or other implements are pulled or pushed just below the soil surface and mineral soil is exposed. On ground that is fairly level and has few surface rocks, a brush beater (heavy duty mower) can be

used to create a fireline. Brush-beat lines do not expose mineral soil and must be supported by other activities. The width of the line is dependent on the potential flame length.

“Wet” Line/Foam Line – Water, water with surfactants, or aqueous firefighting foam (AFFF, or A Triple F) are used to create a fireline. These substances are sprayed on vegetation to increase moisture content and limit fire spread. Wet lines are most often used in short vegetation or fuel (i.e. grass, pine needles) and where flame lengths are short. Wet lines are also used in conjunction with burnout (burning of fuels between fire and fireline) or black lining operations (See *“Black” Line Work Element* below). Vegetation and dead fuel will be sprayed with water or foam. Wet lines have the lowest impact of any human constructed fireline. The line will only be effective as long as the vegetation remains wet. Once the vegetation dries, fire will easily cross the line. Aqueous firefighting foam (AFFF) helps to stretch water and keep vegetation wet longer, but its effects are also temporary. Use of wet lines and foam lines require large amounts of water; a reliable water source must be in the area to support these operations.

Pumping from Streams/Ponds Using Portable Pumps – Water from ponds and streams may be drawn using portable pumps. A two-inch suction hose with a screen on the end is placed in the water source. The water is then pumped to hose lays on the fireline, into large portable storage tanks or bladders, and into fire engines and/or water tenders. Under some circumstances, a dam is constructed in a stream to create a pool deep enough from which to pull water. Portable pumps are often used in areas where fire engines or water tenders cannot access the water source.

Drafting to Fill Engines / Tenders – Water from ponds and streams is used to fill water tanks on fire engines and water tenders. Pumps mounted to the engines or tenders are used to pull water from the pond or stream. The water source must be located in an area where vehicles can drive to within 10 to 15 feet of the water’s edge. Water sources are often found next to roads or near bridges. A hard suction hose, with a screen over the end, is placed in the water. Water is used by the engine, transported to a portable tank, or pumped through hose lays. Under some circumstances, the water source must be improved to gain adequate depth for the end of the suction hose to be completely submerged.

Natural Barriers and Riparian Wetlands – Natural breaks in vegetation and fuel are used when available to help contain prescribed fires. Natural barriers require little if any improvement to stop fire spread. These areas are often rocky ridges or scab flats where the arrangement of vegetation is such that fire cannot move through the plant community. Riparian areas or wetlands are also used as firelines. The vegetation in these areas is too wet to support combustion and is very effective at limiting fire spread. Prescribed fires that use these areas for firelines must conduct activities while these areas are wet. Once they dry for the season, riparian areas or wetlands are no longer effective at limiting fire spread.

Helicopter Dipping – Buckets suspended beneath helicopters may be used for prescribed fires to strengthen the fireline, or to quickly treat hot spots. The pilot controls the bucket remotely. These buckets will most often carry from 100 to 250 gallons of water. Water is obtained from nearby water sources. The helicopter will hover close to the water surface and allow the bucket to fill. This type of operation requires a large water source sufficient to supply the needed water.

Lakes, ponds, larger streams, and rivers are the most frequent sites used to dip water. Helicopter operations require that a helibase or helispot be located close to the project for support.

Hand Built Fireline – The most common form of fireline is constructed using hand tools. The goal is the same as with the other types of fireline: remove the burnable material from the fire. All plant material and downed dead material are removed and mineral soil is exposed. In some instances, chainsaws are used to help remove shrubs and trees and/or branches. Hand built fireline will often be used in conjunction with other activities, such as black lining, wet lining, and brush beating. The width of the line is dependent on the type of fuel in the area and the current or expected flame length. Where lines greater than 2 - 3 feet in width are needed, machinery is often used. Crews of up to 20 people are used to create these lines.

Explosive Built Fireline – In some areas explosives are used to create fireline. This technique is used only under special circumstances and is uncommon. An explosive device, similar to a small diameter hose or small rope, is laid across the ground or used to fall trees. Long runs can be done very quickly. The explosion will expose mineral soils and stop fire spread by removing the burnable fuel.

“Black” Line - Black lines are pre-burned areas that are used as firelines. Black lines are often used in conjunction with another type of fireline. The other type of fireline is constructed and the vegetation is ignited on the inside of the fireline. The hand built, machine built or other fireline is used to keep the fire within the boundaries of the prescribed fire unit. In some cases, a second fireline is constructed and all the burnable material between the two lines is burned. This gives the fire managers the greatest control of the black line operation. In other cases, there is no second fireline and the fire is allowed to burn into the unit. Ignition is often done later in the day to take advantage of cooler night conditions and increases in relative humidity. Black lining can provide a wide fireline without the disturbance that occurs with other methods.

Helicopter Landing Sites and Other Operational Facilities

Many prescribed fires use helicopters for some portion of the operation.

Helicopter Support Sites; refuel, alumigel mix sites, etc. - In remote areas, a temporary facility may be needed to manage the helicopter operations. The size of the helispot will be based on the type of the helicopter, equipment needed, and number of aircraft being used. The helispot will often be located next to a road for ground transport of supplies. The helispot must also have a firm, level surface, and a free line of travel that is clear of obstacles in and out for takeoffs and landings.

A helicopter is used to transport personnel and equipment when an area is remote and inaccessible. The personnel and equipment may be loaded at the helibase or on site helispot. Landing areas require a firm level surface free of obstructions. The size of the landing area will be dependent on the type of helicopter used. In areas where landing is not possible, equipment will be delivered via a long-line. Equipment is attached to a line suspended from beneath the helicopter, then transported and placed in a designated area. Long-line operations have a

minimal impact because the area needed to drop equipment is much smaller than that needed to land a helicopter.

- **Helicopter Refuel** – Helicopter refueling is often done at the helispot. The fuel truck is driven to the helispot and fuel is pumped from the truck's fuel tank to the helicopter. Fuel trucks meet all Department of Transportation (DOT), and Federal Aviation Administration (FAA) regulations regarding fuel transport and transfer.
- **Alumigel Mix Sites** – If a helitorch is used on the project, an area to mix alumigel will be established near the helispot. The alumigel is the fuel for the helitorch. Transport and mixing is done under regulations designated by DOT and FAA. The mixing requires a level area in close proximity of the helispot.

Ignition

The actual application of fire to the landscape can be done using a variety of different techniques and equipment. Fire can be applied using drip torches, from a mechanized piece of equipment with an ignition device, or by a firefighter walking through the prescribed fire unit. Fire can also be applied from the air using a helitorch or a device that drops ping-pong ball sized spheres filled with a flammable chemical. These spheres ignite after contact with the ground.

Hand Ignition – Ignition by ground personnel using drip torches is one of the most common methods. Fire personnel will walk through the unit using drip torches to ignite the area in a set pattern. The torches contain a mixture of gasoline and diesel fuel. Activities associated with this type of ignition would be minimal. Hand ignition gives the fire managers the highest level of control over the ignition pattern.

Mechanized Ignition – In relatively flat terrain, or along roads, mechanized equipment may be used to ignite fuel within the prescribed fire unit. Larger versions of drip torches are mounted to 4-wheelers, pickup trucks, or other vehicles and driven along a road or through the unit igniting the vegetation in a preset pattern. Mechanized ignition allows large areas to be covered in a shorter time period. This is important in larger prescribed fire units. Tera-torches (drip torch capable of applying limited amounts of fire to a unit) are also mounted on vehicles and can be used in prescribed fire operations.

Aerial Ignition – Helicopters are the principle platform for aerial application of fire. Application of fire using helicopters allows large, inaccessible areas to be treated with minimal impacts outside of the fire on the ground. These operations require support at the airport or helispot.

- **Helitorch** – Helicopters can carry a large version of a drip torch capable of applying large amounts of fire to a unit. Helitorch operations are most frequently conducted in areas with large fuels (logs, trees, slash); more recently, this tool is being used in lighter fuel types. The helitorch allows fire managers to ignite a large area relatively short amount of time. The mobility and lack of ground impact is making its use more common. These operations are supported by an alumigel mixing operation at the helispot or landing area.

- **Ping-pong Balls** – Another device commonly used with helicopters is a “ping-pong” ball dispenser. These ping-pong ball sized spheres are filled with potassium permanganate. Just before the balls are dropped from the helicopter, the balls are injected with ethylene glycol. The chemical reaction generates heat and the balls will ignite after they hit the ground. Balls may be dispensed in a pre-determined pattern. This technique allows the fire manager to treat a large area in a short time. This technique is used in lighter fuels, in both forest and shrub-steppe habitats.

Mop-Up

Once objectives have been achieved and ignition is no longer taking place, fire managers must extinguish hot spots within the prescribed fire unit. This is the mop-up phase of the fire. Hot spots are often stumps, downed logs, or other accumulations of dead material that continue to burn after the majority of the fire in the unit has gone out. Firefighters will use a combination of hand tools, fire engines, and hose lays to make sure the fire is contained within the unit before it is abandoned. Standards of mop-up will vary from unit to unit. In most cases, the burning material is exposed and cooled with water and/or soil.

Engine – Fire engines will be used on flat terrain to bring water to the hot spots. Areas must also be free of rocks, or downed material that would limit access by fire engines. Firefighters will use water and hand tools to cool the hot spot. Engines will drive up to the hot spot, or use hose lays to bring water from the engine to the hot spot.

Hand Tools – Firefighters will use hand tools to cool hotspots. Shovels, backpack pumps, and other hand-carried tools (e.g., the Pulaski), are used in areas inaccessible to vehicles, and laying hose. Firefighters will use water from backpack pumps, and moisture in the soil, to cool hot spots. In some circumstances, firefighters will only use soil to cool hot spots.

Hose Lays – In areas where vehicles cannot travel, hose will be placed along the ground and supplied by portable pumps, fire engines or water tenders. Firefighters will use the water and hand tools to cool the remaining hot spots. Long runs of hose can be laid, but once down it is difficult to move. In most cases hose lays are limited to the perimeter of the prescribed fire unit.

Introduction to the Prescribed Fire Effects Tables

For any prescribed fire, both the effects of the activities associated with support and implementation of the fire and the effects of the actual burn must be analyzed. Support and implementation activities have been described above (e.g. fireline construction, mop up, and ignition). The **Activity Components** and *Work Elements* that describe the effects of an actual fire are organized in a slightly different manner than elsewhere in this process.

These activities and effects analysis are defined according to fire regime, existing vegetation type, treatment type, and treatment intensity. In describing the effects of prescribed fire in this process, treatment intensity does NOT mean fire intensity. Rather, it is a qualitative description of the magnitude of the applied fire treatment. It does not refer to any pre-fire treatment levels. Five combinations of fire regime, expressed as fire return interval and fire severity, are defined.

Fire Regime Group	Frequency (Fire Return Interval)	Severity
I	0-35 years	Low severity
II	0-35 years	Stand replacement severity
III	35-100+ years	Mixed severity
IV	35-100+ years	Stand replacement severity
V	>200 years	Stand replacement severity

The **Activity Component** is defined by fire regime (e.g., Fire Regime III) and existing vegetation type (e.g., Aspen). The *Work Element* is defined according to treatment type (e.g., thin, pile and broadcast burn) and treatment intensity (e.g., low intensity). For each treatment intensity, a “post-treatment vegetation description” is provided that describes the predicted condition of the site after that particular treatment. This information is provided in the tables below. If a proposed prescribed fire activity does not fall within a given **Activity Component** and *Work Element*, then consultation for that proposed activity would have to occur outside the National Fire Plan Project Design and Consultation Process.

Aspen Prescribed Fire Effects – General Description and Trends

Quaking aspen (*Populus tremuloides*) constitutes a relatively small proportion of the total land area in the western United States, but contributes significantly to the biodiversity of wildlife and plant communities. Quaking aspen stands can be found in a wide variety of sites ranging from gentle slopes with deep soils to valley bottoms, riparian areas, and steep high talus ridges. The Intermountain region contains over 2.5 million acres of aspen forests. Quaking aspen is associated with montane and subalpine vegetation types along broad elevational and moisture gradients. The elevational distribution of quaking aspen is between 2,500 to over 10,000 feet. The stands most affected by the National Fire Plan projects are, for the most part, located on north slopes, or in areas where snow accumulates and is held for extended periods of time. These stands are surrounded by drier woodland, shrublands or forest types. Their size ranges from a few acres to over 1,000 acres. Stands are, for the most part, dominated by mature aspen stems. The understory may or may not have suckers present in varying quantities. There is a paucity of middle-aged stems or mid level structure to these communities. Stands are composed of large and small individuals.

In the Rocky Mountain region there has been an approximate 60% decline in aspen dominated landscapes due to conifer encroachment. Conifers are replacing quaking aspen throughout much of its range. The loss of quaking aspen is resulting in a decrease in water, forage, and biodiversity. In some areas the conifers have caused a type conversion from hardwood to conifer.

Fire is a natural event in quaking aspen communities and it plays a role in the perpetuation of the stands. Fire stimulates suckers by nullifying apical dominance through the removal of the main stems. The paradox in the system, quaking aspen stands do not readily burn. Certain conditions are required for quaking aspen stands to burn. A dense understory of conifers or shrubs combined with dry conditions favor hot fire with rapid spread. Prior to European settlement, fire occurred on a fairly regular basis. Fires that burned through these stands were typically stand replacing with mixed intensity. The period between fires varied based on inherent site conditions and general climatic patterns. Following settlement conifers and shrubs increased in quaking aspen stands. However, past management practices and public policy did not permit fires to burn through these stands. Today, conifers or old, decadent quaking aspen trees dominate many quaking aspen stands.

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Aspen	<p>Quaking aspen stands with multiple age-class structure. Large aspen trees dominate the stand with subdominant trees present below the canopy of the dominant trees. Numerous saplings and smaller suckers can be found in the understory. On mesic sites the entire understory may have a dense cover of saplings and suckers. Drier sites would have a more open understory with a diverse plant community comprised of grasses and forbs. Shrubs may be present in the understory, but are usually not a major component of the plant community. Some dead aspen trunks may be found standing or dead on the ground. Conifers may be present in varying densities. Quaking aspen stands are often isolated islands within other plant communities. The size of the islands varies and can be less than an acre to several hundred acres.</p>	Broadcast Burn	<p>Common to all treatment intensities: Aboveground stems of quaking aspen are killed by burning. Fencing the quaking aspen stand following treatments may help to protect aspen suckers from all large, wild and domestic herbivores.</p> <p>Low Treatment Intensity: Fire has burned through the stand consuming the upper layer of duff. Small aspen sucker and conifer saplings, if present, are killed. Shrubs, herbaceous vegetation and small downed woody debris is also consumed. Larger standing snags and downed woody debris is charred, but not consumed in the fire. Little to no bare ground is exposed. Suckering is patchy following the fire. The greatest response of the understory vegetation occurs in open areas of the stand.</p> <p>Moderate Treatment Intensity: Fire has burned smaller vegetation in the stand, but has not killed large dominant trees. All but the largest down woody debris has been consumed. Over half of the duff has been consumed and in areas of high fuel concentrations bare ground occurs. Suckering occurs vigorously in larger open areas and around the perimeter of the stand. Herbaceous vegetation is also dense in areas where bare ground has been exposed. Areas where large down woody debris was consumed may remain unvegetated for 3-5 years.</p> <p>High Treatment Intensity: Fire has killed all to most of the standing trees (aspen and conifer). Most woody debris on the ground has been consumed and mineral soil has been exposed throughout the majority of the stand. Suckering occurs vigorously throughout most of the stand. Herbaceous vegetation also responds vigorously to burning. Areas of high fuel concentrations may remain unvegetated for a few years. Some large quaking aspen stems will fall, while others will remain standing for a number of years. In most cases stems with the greatest amount of rot will fall before the more solid stemmed individuals.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Aspen	<p>Quaking aspen stands have been encroached by conifers. Encroachment is significant enough to suppress quaking aspen. Numbers of conifer saplings and seedlings may outnumber quaking aspen suckers. The stand may be composed of a dominant quaking aspen layer with a subdominant layer of conifers. Conifers may also dominate the stand with few live quaking aspen stems left standing. In some stands where the conifer encroachment has been significant, only a few isolated quaking aspen may be present and a large number of dead aspen trunks may be on the ground. Understory vegetation is also much reduced in these stands. The litter layer is comprised of a combination of quaking aspen leaves and conifer needles.</p>	<p>Thinning</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Common to all treatment intensities: Above-ground stems of aspen are killed by burning. Fencing the quaking aspen stand following treatments may help to protect aspen suckers from all large, wild and domestic herbivores</p> <p>Quaking aspen stands are thinned by removing the associated conifer species. Few to no quaking aspen are cut in the thinning operation. Cut trees are felled and left in place to provide protection quaking aspen suckers. Some soil disturbance may occur due to the cutting activity. However, these are usually isolated areas where mineral soil is exposed. Herbaceous and associated shrubby vegetation may also respond to the removal of the conifer overstory. This is most likely to occur in the open areas of the stand where quaking aspen density is low. In stands where the conifer encroachment was severe and there was a low number of larger quaking aspen, suckering will be reduced in the first few years following cutting. Fencing the stand from all herbivores, wild and domestic, will provide additional protection for aspen suckers.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Aspen	<p>Quaking aspen stands have been encroached by conifers. Encroachment is significant enough to suppress quaking aspen. Numbers of conifer saplings and seedlings may outnumber quaking aspen suckers. The stand may be composed of a dominant quaking aspen layer with a subdominant layer of conifers. Conifers may also dominate the stand with few live quaking aspen stems left standing. In some stands where the conifer encroachment has been significant, only a few isolated quaking aspen may be present and a large number of dead aspen trunks may be on the ground. Understory vegetation is also much reduced in these stands. The litter layer is comprised of a combination of quaking aspen leaves and conifer needles.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Common to all treatment intensities: Above-ground stems of aspen are killed by burning. Fencing the quaking aspen stand following treatments may help to protect aspen suckers from all large, wild and domestic herbivores</p> <p>Low Treatment Intensity, Moderate Treatment Intensity and High Treatment Intensity: Conditions will be similar to broadcast burning. Intensity will be related to the amount of slash left following the thinning operation. The greater the number of trees removed and amount of slash left on site, the higher the intensity of treatment.</p>

Cedar, Hemlock, Fir Prescribed Fire Effects

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III Mixed severity, Lethal & Nonlethal, creates mosaic of patterns	Cedar, Hemlock, Fir, Condition Class 1 Ranges from north of Clearwater basin in Idaho to Canadian border, W. Montana, NE. & W. Washington, NW. Oregon & along OR. Coast, mainly wet areas (covers 25% of area). Highly productive sites w/ more to pile & burn, more duff & litter to reduce sediment delivery, faster regeneration	Condition Class 1 - Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large trees are common in the following order of dominance: white pine, western larch, Douglas-fir, cedar, spruce, true fir, western hemlock, with minor amounts of ponderosa pine, lodgepole pine and hardwoods. All stands have been previously thinned to encourage seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Small amount of understory, shade tolerant conifers scattered throughout unit. Other understory vegetation includes high diversity of grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.	Thin, Machine pile, burn piles Machine piling preferred on slopes <35-40% slope. See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning. See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.	Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Low Treatment Intensity = Scorch damage on up to 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned). Most likely scenario at mid to upper elevations. Moderate Treatment Intensity = Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned). High Treatment Intensity = Not likely to occur (at mid to upper elevations) since piles are normally covered and burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (low chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 1	<p>Condition Class 1 – Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large trees are common in the following order of dominance: white pine, western larch, Douglas-fir, cedar, spruce, true fir, western hemlock, with minor amounts of ponderosa pine, lodgepole pine and hardwoods. All have been previously thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Small amount of understory, shade tolerant conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity = Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs partially consumed or consumed. Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity = 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs partially consumed or consumed.</p> <p>High Treatment Intensity = 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 50% of snags and up to 75% of large downed logs partially consumed or consumed.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 1	Condition Class 1 – Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large trees are common in the following order of dominance: white pine, western larch, Douglas-fir, cedar, spruce, true fir, western hemlock, with minor amounts of ponderosa pine, lodgepole pine and hardwoods. Small amount of understory conifers (true fir, spruce, cedar, hemlock) scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.	Broadcast Burn	<p>Low Treatment Intensity = Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 20% of snags and up to 30% of large downed logs partially consumed or consumed. Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity = 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 30% of snags and up to 50% of large downed logs partially consumed or consumed.</p> <p>High Treatment Intensity = 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 50% of snags and up to 75% of large downed logs partially consumed or consumed.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and if last fire was stand replacing, shade-tolerant species are increasing. If last fire severity was non-lethal, large diameter, over- mature white pine, western larch, Douglas fir dominate with some true fir, cedar and western hemlock. Otherwise, cedar and shade tolerant species dominate. Stand may be single or multi-aged depending on past fire regime intensity. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Most smaller diameter, understory true fir, spruce and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by shade-tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present (depending on safety factors). Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.</p>	<p>Thin, Machine pile, burn piles.</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile.</p> <p>Low Treatment Intensity = Scorch damage on 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity (from fire creeping outside the pile boundaries) total of 20% of treatment area burned.</p> <p>Moderate Treatment Intensity = Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity = Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (low chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and if last fire was stand replacing, shade-tolerant species are increasing. If last fire severity was non-lethal, large diameter, over- mature white pine, western larch, Douglas fir dominate with some true fir, cedar and western hemlock. Otherwise, cedar and shade tolerant species dominate. Stand may be single or multi-aged depending on past fire regime intensity. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Most small diameter, understory true fir, spruce, and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by tolerant, Other understory vegetation includes grasses, forbs, and shrubs. Up to 20 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity = Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs partially consumed or consumed.</p> <p>Moderate Treatment Intensity = 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs partially consumed or consumed.</p> <p>High Treatment Intensity = 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs partially consumed or consumed.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 2	Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and if last fire was stand replacing, shade-tolerant species are increasing. If last fire severity was non-lethal, large diameter, over- mature white pine, western larch, Douglas fir dominate with some true fir, cedar and western hemlock. Otherwise, cedar and shade tolerant species dominate. Stand may be single or multi-aged depending on past fire regime intensity. Many small diameter, understory true fir, spruce, cedar and hemlock trees are scattered throughout the treatment area. Other understory vegetation includes grasses, forbs, and shrubs. Up to 20 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.	Broadcast Burn	<p>Low Treatment Intensity = Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs partially consumed or consumed.</p> <p>Moderate Treatment Intensity = 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs partially consumed or consumed.</p> <p>High Treatment Intensity = 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs partially consumed or consumed.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 3	Condition Class 3 – Stand has missed many past fire disturbance cycles and may have converted to cedar, true fir, western hemlock and shade-tolerant species if last fire was stand replacing (late seral species that are more sensitive to fire). Stand may be single or multi-aged depending on past fire regime intensity. If last fire severity was lethal, all-aged, large-diameter, over- mature cedar, western hemlock and true fir dominate with very little white pine, western larch or Douglas fir. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Many understory trees have been cut and remaining understory trees are scattered throughout the treatment area and dominated by true fir, spruce and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Duff and litter are thicker than other condition classes and cover types. Over 20 snags per acre present depending on safety concerns. Not all sites have cedar. Duff and litter are thicker than other cover types and condition classes.	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities - 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile.</p> <p>Low Treatment Intensity = Scorch damage on 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned).</p> <p>Moderate Treatment Intensity = Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity = Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (low chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and may have converted to cedar, true fir, western hemlock and shade-tolerant species if last fire was stand replacing (late seral species that are more sensitive to fire). Stand may be single or multi-aged depending on past fire regime intensity. If last fire severity was lethal, all-aged, large-diameter, over- mature cedar, western hemlock and true fir dominate with very little white pine, western larch or Douglas fir. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Many understory trees have been cut and remaining understory trees are scattered throughout the treatment area and dominated by true fir and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Duff and litter are thicker than other condition classes and cover types. Over 20 snags per acre present depending on safety concerns. Not all sites have cedar. Duff and litter are thicker than other cover types and condition classes.</p>	Thin, Broadcast Burn	<p>Low Treatment Intensity = Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 40% of large downed logs partially consumed or consumed.</p> <p>Moderate Treatment Intensity = 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 40% of snags and up to 60% of large downed logs partially consumed or consumed.</p> <p>High Treatment Intensity = 40-60% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60%+ of snags and up to 80%+ of large downed logs partially consumed or consumed.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Cedar, Hemlock, Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and may have converted to cedar, true fir, western hemlock and shade-tolerant species if last fire was stand replacing (late seral species that are more sensitive to fire). Stand may be single or multi-aged depending on past fire regime intensity. If last fire severity was lethal, all-aged, large-diameter, over- mature cedar, western hemlock and true fir dominate with very little white pine, western larch or Douglas fir. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Understory trees are heavy and scattered throughout the treatment area and dominated by true fir, spruce, cedar and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Duff and litter are thicker than other condition classes and cover types. Over 20 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types and condition classes.</p>	Broadcast Burn	<p>Low Treatment Intensity = Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 40% of large downed logs partially consumed or consumed.</p> <p>Moderate Treatment Intensity = 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 40% of snags and up to 60% of large downed logs partially consumed or consumed.</p> <p>High Treatment Intensity = 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs partially consumed or consumed.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V Fire intervals long - 200 yrs (longer & episodic in regime V). Often stand replacing	Cedar, Hemlock, Fir, Condition Class 1 Ranges from north of Clearwater basin in Idaho to Canadian border, W. Montana, NE. & W. Washington, NW. Oregon & along OR. Coast, mainly wet areas (covers 25% or area). Highly productive sites w/ more to pile & burn, more duff & litter to reduce sediment delivery, & faster regeneration	Condition Class 1 - Stand has not missed any past fire disturbance cycles but is nearing or at maturity. Large trees are common in the following order of dominance: white pine, western larch, Douglas-fir, spruce, true fir, western hemlock, cedar, with minor amounts of ponderosa pine, lodgepole pine and hardwoods. More seral species than higher condition classes. All have been previously thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Small amount of understory, shade tolerant conifers scattered throughout unit. Other understory vegetation includes high diversity of grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.	Thin, Machine pile, burn piles Machine piling preferred on slopes <35-40% slope. See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning. See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.	Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Low Treatment Intensity - Scorch damage on up to 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned). Most likely scenario at mid to upper elevations. Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned). High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (low chance unless large & close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 1	<p>Condition Class 1 – Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large trees are common in the following order of dominance: white pine, western larch, Douglas-fir, spruce, true fir, western hemlock, cedar, with minor amounts of ponderosa pine, lodgepole pine and hardwoods. All have been previously thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Small amount of understory, shade tolerant conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present. . Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.</p>	<p>Thin, Broadcast Burn (underburn/ jackpot burn)</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs heavily damaged or burned up. Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 50% of snags and up to 75% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 1	Condition Class 1 – Stand has not missed any past fire disturbance cycles but is nearing or at maturity. Large trees are common in the following order of dominance: white pine, western larch, Douglas fir, spruce, true fir, western hemlock, cedar, with minor amounts of ponderosa pine, lodgepole pine and hardwoods. More seral species than higher condition classes. Small amount of understory conifers (true fir, spruce, cedar, hemlock) scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types, but not as thick as higher condition classes.	Broadcast burn (underburn/ jackpot burn)	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs heavily damaged or burned up. Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 50% of snags and up to 75% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over-mature white pine, western larch, Douglas fir dominate with some true fir, cedar and western hemlock all of which have been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Most smaller diameter, understory true fir, spruce and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by shade-tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present (depending on safety factors). Not all sites have cedar. Duff and litter are thicker than other cover types but not as thick as Condition Class 3.</p>	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile.</p> <p>Low Treatment Intensity - Scorch damage on 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned).</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (low chance unless large & close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over-mature white pine, western larch, Douglas fir dominate with some true fir, cedar and western hemlock all of which have been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Most small diameter, understory true fir, spruce, and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present (depending on safety factors). Not all sites have cedar. Duff and litter are thicker than other cover types but not as thick as Condition Class 3.</p>	<p>Thin, Broadcast Burn (underburn/ jackpot burn)</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over-mature white pine, western larch, Douglas fir dominate with some true fir, cedar and western hemlock. Many small diameter, understory true fir, spruce, cedar and hemlock trees are scattered throughout the treatment area. Other understory vegetation includes grasses, forbs, and shrubs.</p> <p>Up to 20 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other cover types but not as thick as Condition Class 3.</p>	Broadcast Burn (underburn/ jackpot burn)	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 20% of snags and up to 30% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 30% of snags and up to 50% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 60% of snags and up to 80% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and has converted to cedar, true firs, western hemlock, shade-tolerant species (late seral species that are more sensitive to fire). All aged, large diameter, over-mature cedar, western hemlock and true fir dominate with very little white pine, western larch or Douglas fir. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Many understory trees have been cut and remaining understory trees are scattered throughout the treatment area and dominated by true fir, spruce and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Over 20 snags per acre present depending on safety concerns. Not all sites have cedar. Duff and litter are thicker than other condition classes and cover types.</p>	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile.</p> <p>Low Treatment Intensity - Scorch damage on 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned).</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (low chance unless large & close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and has converted to cedar, true fir, western hemlock and shade-tolerant species (late seral species that are more sensitive to fire). All aged, large diameter, over-mature cedar, western hemlock and true fir dominate with very little white pine, western larch or Douglas fir. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Many understory trees have been cut and remaining understory trees are scattered throughout the treatment area and dominated by true fir and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Over 20 snags per acre present depending on safety concerns. Not all sites have cedar. . Duff and litter are thicker than other condition classes and cover types.</p>	<p>Thin, Broadcast Burn (underburn/ jackpot burn)</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring. Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring. Up to 40% of snags and up to 60% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 40-60% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 60%+ of snags and up to 80%+ of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Cedar, Hemlock, Fir, Condition Class 3	Condition Class 3 – Stand has missed many past fire disturbance cycles and has converted to cedar, true fir, western hemlock and shade-tolerant species (late seral species that are more sensitive to fire). All aged, large diameter, over-mature cedar, western hemlock and true fir dominate with very little white pine, western larch or Douglas-fir. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Understory trees are heavy and scattered throughout the treatment area and dominated by true fir, spruce, cedar and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Over 20 snags per acre present. Not all sites have cedar. Duff and litter are thicker than other condition classes and cover types.	Broadcast Burn (underburn/ jackpot burn)	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring. Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 40% of snags and up to 60% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 60% of snags and up to 80% of large downed logs heavily damaged or burned up.</p>

Lodgepole Pine, Douglas Fir, True Fir Prescribed Fire Effects

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	<p>Lodgepole Pine, Douglas Fir, True Fir, Condition Class 1</p> <p>Occurs in southern Utah to Canada; Rockies to crest of Cascades. Across 90% of the footprint of this process. Mid to higher elevations. Higher moisture available than lower ponderosa pine sites.</p>	<p>Condition Class 1 - Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large pole to mature size lodgepole pine alone or mixed w/ Douglas fir, western larch, white pine, hardwoods with small amounts of spruce, western hemlock or true fir. Stand may be single or multi-aged depending on past fire regime intensity. All have been previously thinned to favor seral species. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Small amount of understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p>	<p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas Fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Low Treatment Intensity - Scorch damage on up to 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles.. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned). Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 1	<p>Condition Class 1 - Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large pole to mature size lodgepole pine alone or mixed w/ Douglas fir, western larch, white pine, hardwoods with smaller amounts of spruce, true fir or western hemlock. Stand may be single or multi-aged depending on past fire regime intensity. All have been previously thinned to favor seral species. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Small amount of understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs partially consumed or consumed. Most likely scenario at mid to upper elevations. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs partially consumed or consumed. Western larch, Douglas-fir and ponderosa pine will be favored to survive where present.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 50% of snags and up to 70% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 1	<p>Condition Class 1 – Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large pole to mature size lodgepole pine alone or mixed with Douglas fir, western larch, white pine, hardwoods with smaller amounts of spruce, western hemlock or true fir. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Stand may be single or multi-aged depending on past fire regime intensity. Small amount of understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	Broadcast Burn	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs partially consumed or consumed. Most likely scenario at mid to upper elevations. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 50% of snags and up to 70% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 2	<p>Condition Class – 2 Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Stand has been thinned to favor Douglas fir, western larch, lodgepole pine, or western white pine with minimal true fir, spruce or western hemlock scattered. Some tree limbing may be part of treatment in Wildland Urban Interface. Stand may be single or multi-aged depending on past fire regime intensity. Most smaller diameter, understory true fir, spruce and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present (depending on safety factors).</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>All Treatment Intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Low Treatment Intensity - Scorch damage on 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned).</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Stand has been thinned to favor Douglas fir, western larch, lodgepole pine, or western white pine with minimal true fir, spruce or western hemlock scattered. Some tree limbing may be part of treatment in Wildland Urban Interface. Stand may be single or multi-aged depending on past fire regime intensity. Most small diameter, understory true fir, spruce and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present (depending on safety factors).</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring. Up to 30% of snags and up to 40% of large downed logs partially consumed or consumed. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring. Up to 40% of snags and up to 60% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring. Up to 60% of snags and up to 80% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and if last fire was stand replacing, has shade-tolerant species increasing. Stand may be single or multi-aged depending on past fire regime intensity. If past fire severity was non-lethal, large diameter Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Douglas fir, western larch, lodgepole pine, or western white pine dominate with true fir, spruce or western hemlock scattered. Many small diameter, understory true fir, spruce and hemlock trees are scattered throughout the treatment area and dominated by shade-tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 20 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	Broadcast Burn	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 30% of snags and up to 40% of large downed logs partially consumed or consumed. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 40% of snags and up to 60% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 60% of snags and up to 80% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and may have converted to true firs, western hemlock and shade-tolerant species if last fire was stand replacing. More late seral species without disturbance that are more sensitive to fire. Stand may be single or multi-aged depending on past fire regime intensity. Stand has been thinned to favor Douglas fir, western larch, lodgepole pine, or western white pine with minimal true fir, spruce or western hemlock scattered. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Pathogens, insects and possibly past fires have increased some damage to trees and created excessive fuels. Understory trees are scattered throughout the treatment area and are dominated by true fir, spruce and western hemlock. Understory plants also include grasses, forbs, and shrubs. Over 20 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Low Intensity - Scorch damage on up to 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned). Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and may have converted to true firs, western hemlock and shade-tolerant species if last fire was stand replacing. More late seral species without disturbance that are more sensitive to fire. Stand may be single or multi-aged depending on past fire regime intensity. Stand has been thinned to favor Douglas fir, western larch, lodgepole pine, or western white pine with minimal true fir, spruce or western hemlock scattered. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Pathogens, insects and possibly past fires have increased some damage to trees and created excessive fuels. Understory trees are scattered throughout the treatment area and are dominated by true fir, spruce and western hemlock. Understory plants also include grasses, forbs, and shrubs. Over 20 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 40% of large downed logs partially consumed or consumed. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks soil moisture and temperature conditions are favorable for plant growth. Up to 40% of snags and up to 60% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p> <p>High Treatment Intensity - 40-60% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60%+ of snags and up to 80%+ of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 3	<p>Condition Class 3--Stand has missed many past fire disturbance cycles and may have converted to true firs, western hemlock and shade-tolerant species if last fire was stand replacing. More late seral species present without disturbance that are more sensitive to fire. Stand may be single or multi-aged depending on past fire regime intensity. If past fire severity was non-lethal, large diameter Douglas fir, western larch, lodgepole pine, or western white pine dominate with true fir, spruce or western hemlock scattered. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Pathogens, insects and possibly past fires have increased some damage to trees and created excessive fuels. Understory trees are scattered throughout the treatment area and are dominated by true fir, spruce and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Over 20 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	Broadcast Burn	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 40% of large downed logs partially consumed or consumed. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 40% of snags and up to 60% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs partially consumed or consumed. Western larch, Douglas fir and ponderosa pine will be favored to survive where present.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V Lethal, stand replacing fires at intervals of 100 or 200+ years	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 1 Occurs in southern Utah to Canada, Rockies to crest of Cascades. Across 90% of footprint of this process. Mid to higher elevations. Higher moisture available than lower ponderosa pine sites.	Condition Class 1 - Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes large pole to mature size lodgepole pine alone or mixed with Douglas fir, western larch, white pine, hardwoods with small amounts of spruce, western hemlock or true fir. All have been previously thinned to favor seral species. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Small amount of understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present. Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.	Thin, Machine pile, burn piles Machine piling preferred on slopes <35-40% slope See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning. See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.	Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive to heating by fire and most likely to die. Lodgepole pine regenerates easily after disturbance. Low Treatment Intensity - Scorch damage on up to 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned). Most likely scenario at mid to upper elevations. Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned). High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V Lethal, stand replacing fires at intervals of 100 or 200+ years	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 1 Occurs in southern Utah to Canada, Rockies to crest of Cascades. Across 90% of footprint of this process. Mid to higher elevations. Higher moisture available than lower ponderosa pine sites.	<p>Condition Class 1 – Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes Large pole to mature size lodgepole pine alone or mixed w/ Douglas fir, western larch, white pine, hardwoods with smaller amounts of spruce, true fir or western hemlock. All have been previously thinned to favor seral species Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Small amount of understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	Thin, Broadcast Burn	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs heavily damaged or burned up. Most likely scenario at mid to upper elevations. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, climax species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 50% of snags and up to 70% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 1	<p>Condition Class 1 – Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes Large pole to mature size lodgepole pine alone or mixed with Douglas fir, western larch, white pine, hardwoods with smaller amounts of spruce, western hemlock or true fir. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Small amount of understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	Broadcast Burn	<p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 20% of snags and up to 30% of large downed logs heavily damaged or burned up. Most likely scenario at mid to upper elevations. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, climax species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 50% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 50% of snags and up to 70% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over-mature lodgepole pine mixed with Douglas fir, western larch, white pine, with smaller amounts of spruce, western hemlock or true fir all of which have been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Smaller diameter, understory true fir, spruce and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by shade-tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present (depending on safety factors).</p> <p>Restoration treatments would reduce true fir/spruce in favor western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>All Treatment Intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, climax species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Low Treatment Intensity - Scorch damage on 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned).</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 2	<p>Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over- mature lodgepole pine mixed with Douglas fir, western larch, white pine, with smaller amounts of spruce, western hemlock or true fir all of which have been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Most small diameter, understory true fir, spruce and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present (depending on safety factors). Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 40% of snags and up to 60% of large downed logs may be partially or totally consumed.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 2	Condition Class 2 – Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over- mature lodgepole pine mixed with Douglas fir, western larch, white pine, with smaller amounts of spruce, western hemlock or true fir Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Many small diameter, understory true fir, spruce and hemlock trees are scattered throughout the treatment area and dominated by shade-tolerant, climax species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 20 snags per acre present. Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.	Broadcast Burn	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, climax species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 40% of snags and up to 60% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and has converted to true firs, western hemlock, and shade-tolerant species. More late seral species present without disturbance that are more sensitive to fire. Large diameter true fir, spruce or western hemlock dominates with remnant Douglas fir, western larch, lodgepole pine, or western white pine scattered. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Many understory trees have been cut and piled with remaining understory trees scattered throughout the treatment area and dominated by true fir, spruce and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Over 20 snags per acre present depending on safety concerns.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Machine pile, burn piles</p> <p>Machine piling preferred on slopes <35-40% slope.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile.</p> <p>Low Treatment Intensity - Scorch damage on up to 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned). Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and has converted to true firs, western hemlock and shade-tolerant species. More late seral species present without disturbance that are more sensitive to fire. Large diameter true fir, spruce or western hemlock dominates with remnant Douglas fir, western larch, lodgepole pine, or western white pine scattered. Stand has been thinned to favor seral species. Some tree limbing may be part of treatment in Wildland Urban Interface. Pathogens and insects have increased damage to trees and have created excessive fuels and many accumulations. Many understory trees have been cut and remaining understory trees are scattered throughout the treatment area and are dominated by true fir, spruce and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Over 20 snags per acre present, depending on safety concerns.</p> <p>Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	<p>Thin, Broadcast Burn</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring. Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring. Up to 40% of snags and up to 60% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 40-60% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if burned in spring or late summer/early fall. Up to 60%+ of snags and up to 80%+ of large downed logs heavily damaged or burned up.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV & V	Lodgepole Pine, Douglas Fir, True Fir, Condition Class 3	<p>Condition Class 3 – Stand has missed many past fire disturbance cycles and has converted to true firs, western hemlock and shade-tolerant species. More climax species present without disturbance that are more sensitive to fire. Large diameter true fir, spruce or western hemlock dominates with remnant Douglas fir, western larch, lodgepole pine, or western white pine scattered. Some tree limbing and understory slashing may be part of treatment in Wildland Urban Interface. Pathogens and insects have increased damage to trees and have created excessive fuels. Understory trees are heavily scattered throughout the treatment area and are dominated by true fir, spruce and western hemlock. Other understory vegetation includes grasses, forbs, and shrubs. Over 20 snags per acre present. Restoration treatments would reduce true fir/spruce in favor of western larch, Douglas fir, lodgepole pine or ponderosa pine. Wildland Urban Interface treatments would reduce fuels in addition to above.</p>	Broadcast Burn	<p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 40% of snags and up to 60% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperature conditions are favorable for plant growth. Up to 60% of snags and up to 80% of large downed logs heavily damaged or burned up.</p>

Pinyon-Juniper and Juniper Woodlands - General Descriptions and Trends

Pinyon-juniper and juniper woodlands are found throughout the area covered by this process. Juniper (lacking pinyon) is found in Oregon, Nevada, Montana, Washington, Idaho, and northern portions of Nevada. Pinyon-juniper woodlands are found in Nevada, Utah, Wyoming, and Idaho. Some current pinyon-juniper or juniper woodlands may be vegetatively classified as sagebrush because pinyon-juniper and juniper woodlands have been colonizing sites that were formerly dominated by shrubs. Of the current pinyon-juniper and juniper woodlands, less than 20% can be considered "historic" woodlands. About 80% of current pinyon-juniper and juniper cover was formerly dominated by shrubs. The younger (established within the last 150 years) pinyon-juniper and juniper woodlands generally surround the older woodlands. Most fuels projects would be focused on the pinyon-juniper and juniper woodlands that established within the last 120 to 150 years.

In some locations, pinyon-juniper and juniper densities have increased to the point that understory vegetation density and cover have been severely reduced. In these instances, broadcast burning may not be the most effective tool for treatment because only very intense fires may carry. Where there is very little to no understory vegetation, mechanical treatments are likely to be the preferred treatment types. In the Wildland Urban Interface, mechanical treatments may also be the preferred treatment type because of the extreme conditions required to burn mature woodlands.

In areas with sufficient understory, broadcast burns are usually fast moving in the shrub and grass fuels and pinyon and juniper trees may be easily killed if fires are intense enough to cause torching in the trees. In activity fuels, broadcast burning is likely to be of a longer duration possibly resulting in more soil impacts. One soil impact of concern is soil hydrophobicity following burning. This may occur in longer duration burns. Depending on the location, broadcast burning can be accomplished during most parts of the year, with spring and fall being the most common. Mechanical treatments can take place almost year-round if areas are free of snow. However, high soil moisture conditions may limit activity of machinery during the spring, winter and fall. Pile burning generally occurs in the fall or winter, after rain or snow events.

Some anecdotal evidence indicates that fuel treatment in pinyon-juniper and juniper woodlands results in increased water yields in springs and drainages near where trees were removed. If trees are removed and the native understory is allowed to regenerate, there would likely be less erosion into the streams due to increased ground cover. Invasive annuals may be a large component of this vegetation type. Site with understoreys dominated by invasive annuals are not be covered by this process.

Pinyon-juniper and Juniper Woodlands Prescribed Fire Effects

Activity Component		Work Element		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
II	Pinyon-juniper and juniper woodlands	Young pinyon-juniper or juniper invasion into historical sagebrush-steppe ecosystem. Only natural fuels are on-site; few to no activity fuels are on-site. Some scattered old-growth pinyon and/or juniper trees may be present on shallow soil sites or rocky sites. Understory vegetation is sufficient to carry fire from tree to tree. Annual invasive species may occur in the treatment area, but do not dominate the understory.	Broadcast Burn	<p>Common to all treatment Intensities: Grass and forb (and some sprouting shrub) species will begin to sprout shortly following the burn if soil temperature and moisture conditions are conducive to plant growth. Sagebrush seedlings will be evident one to five years following burning. Seeding of grasses, forbs and/or shrubs may be necessary following the broadcast burn treatment. The amount of heat transferred to the soil surface will be directly proportional to the pre-burn fuel loadings.</p> <p>Low Treatment Intensity - Broadcast burning will create patches of burned and unburned areas (less than 50% of the area burned). In the burned areas, woody plants are killed and above-ground portions of the herbaceous plants are consumed. Mortality will occur in 10 to 50% of small, young pinyon and/or juniper trees across the treatment area. In patches where burning occurs, there will be low to moderate ground scorch severity.</p> <p>Moderate Treatment Intensity - Broadcast burning will create patches of burned and unburned areas, with more burned patches (up to 75% of the area burned). In the burned areas, woody plants are killed and aboveground portions of the herbaceous plants are consumed. Mortality will occur in up to 75% of small, young pinyon and/or juniper trees across the treatment area. In patches where burning occurs, there will be low to high ground scorch severity.</p> <p>High Treatment Intensity - Broadcast burning will occur over all of the landscape. Woody plants are killed and aboveground portions of the herbaceous plants are consumed across the entire area. Mortality will occur in up to 100% of small, young pinyon and/or juniper trees. Depending on the size of the burn, it may take several years for sagebrush seedlings to recolonize the interior areas of the burn. Where burning occurs, there will be moderate to high ground scorch severity.</p>

Activity Component		Pre-Treatment Vegetation Description	Work Element	
Fire Regime	Existing Vegetation Type		Treatment Type	Post-treatment Vegetation Description
II	Pinyon-juniper and juniper woodlands	Clumps of widely spaced individuals of young pinyon-juniper or juniper invasion into historical sagebrush-steppe ecosystem. Clumps or widely spaced individuals are interspersed with hand or machined-piled pinyon and/or juniper boles, branches and/or needles. Piled vegetation resulted from previous hand or mechanical pinyon and/or juniper removal treatment. Some scattered old-growth pinyon and/or juniper trees may be standing on shallow soil sites or rocky sites. Understory grass, forb and shrub vegetation is sparse to moderate and may or may not be sufficient to carry fire from pile to pile. Annual invasive species may occur in the treatment area, but do not dominate the understory.	<p>Activity fuels piled, then piles burned</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: Piles cover up to 40% of the treatment area. Remaining clumps of trees and shrubs will have some additional mortality from heat and flames resulting from pile burning (up to 20% of remaining trees and/or shrubs) if piles are constructed close to residual trees and shrubs. Following pile burning, there will be severe ground heating below piles (up to 40% of the area). The amount of heat transferred to the soil surface will be directly proportional to the amount of fuel in the piles. Sprouting or seedling establishment may be reduced beneath the piles for several years.</p> <p>Low Treatment Intensity - Up to 10% of the area may also be burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of the treatment area burned). Tree and shrub mortality may occur from creeping piles. Some larger branch wood and boles in the piles will not be completely consumed and will remain on the site.</p> <p>Moderate Treatment Intensity - 10-40% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 80% of total treatment area burned). Tree and shrub mortality may occur from creeping piles. Most larger branch wood and boles in the piles will be completely consumed.</p> <p>High Treatment Intensity - more than 40% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (80 to 100% of total treatment area burned). Tree and shrub mortality may occur from creeping piles. All piled vegetation will be completely consumed.</p>

Activity Component		Work Element		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-treatment Vegetation Description
II	Pinyon-juniper and juniper woodlands	Clumps or widely spaced individuals of young pinyon-juniper or juniper invasion into historical sagebrush-steppe ecosystem. Clumps or widely spaced individuals are interspersed with scattered hand or machined-cut pinyon and/or juniper boles, branches and/or needles. Some dispersed old-growth pinyon and/or juniper trees may be standing on shallow soil sites or rocky sites. The scattered material will be the main fuel carrying the broadcast burn because understory grass, forb and shrub vegetation is sparse. Annual invasive species may occur in the treatment area, but do not dominate the understory.	<p>Activity fuels scattered, then broadcast burned</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: Grass, forb, and some sprouting shrub species will begin to sprout shortly following the burn if soil moisture and temperature conditions are conducive for plant growth. Sagebrush seedlings will be evident one to five years following burning. Seeding of grasses, forbs and/or shrubs may be necessary following the broadcast burn treatment in areas where residual vegetation is insufficient to re-vegetate the site. The amount of heat transferred to the soil surface will be directly proportional to the pre-burn fuel loadings.</p> <p>Low Treatment Intensity - Broadcast burning will create patches of burned and unburned areas (less than 50% of the area burned). In the burned areas, some woody plants are killed and aboveground portions of the other sprouting shrubs and herbaceous plants are consumed. Mortality will occur in 10 to 50% of small, young pinyon and/or juniper trees across the treatment area. In burned patches there will be low to moderate ground scorch severity. Some scattered larger branch wood and boles will not be completely consumed and will remain on the site.</p> <p>Moderate Treatment Intensity - Broadcast burning will create patches of burned and unburned areas, with more burned patches (up to 75% of the area burned). In the burned areas, some woody plants are killed and aboveground portions of the sprouting shrubs and herbaceous plants are consumed. Mortality will occur in up to 75% of small, young pinyon and/or juniper trees across the treatment area. In burned patches there will be low to high ground scorch severity. Most scattered larger branch wood and boles will be completely consumed.</p> <p>High Treatment Intensity - Broadcast burning will occur over all of the landscape. Some woody plants are killed and aboveground portions of the sprouting shrubs and herbaceous plants are consumed across the entire area. Mortality will occur in up to 100% of small, young pinyon and/or juniper trees. Depending on the size of the burn, it may take several years for sagebrush seedlings to recolonize the interior areas of the burn. Where burning occurs, there will be moderate to high ground scorch severity. Most scattered vegetation is completely consumed.</p>

Oak Woodland / Oak-maple / Interior Chaparral / Mountain Brush Prescribed Fire Effects

Activity Component			Work Element	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-treatment Vegetation Description
II	Oak woodland/oak-maple/ interior chaparral/ mountain brush	Clumps of dense, homogenous woodland or shrub interspersed with hand or machine-piled woodland or shrub. Piled vegetation resulted from hand or mechanical treatment. Dominant species of woodland and shrub may include: Gambel's oak, bigtooth maple, mountain mahogany, serviceberry, snowberry, bitterbrush, manzanita, ceanothus, silk tassel, madrone or other evergreen oaks.	<p>Activity fuels piled, then piles burned</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: Piles cover up to 30% of the treatment area. Remaining clumps of woodlands and shrubs will have some additional mortality from heat and flames resulting from pile burning (up to 20% of remaining woodland or shrubs) if piles are located close. Following pile burning, there will be severe ground heating below piles (up to 30% of the area). Prolific sprouting can be expected, except in areas where piles were constructed. Sprouting below piles ranges from minimal to no sprouting. If objectives are to reduce woodland or shrub densities over time, successive years of cutting and piling, and/or burning may be needed to deplete vegetative reserves and reduce future sprouting. Almost all large woody debris and snags are absent since they likely did not occur in the overstory.</p> <p>Low Treatment Intensity - Up to 20% of the area may also be burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of the treatment area burned). Woodland and shrub mortality may occur in areas burned by creeping piles. Most piled vegetation is completely consumed – only larger branch wood may remain.</p> <p>Moderate Treatment Intensity - 20-50% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 80% of total treatment area burned). Woodland and shrub mortality may occur in areas burned by creeping piles. Most piled vegetation is completely consumed.</p> <p>High Treatment Intensity - more than 50% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (80 to 100% of total treatment area burned). Woodland and shrub mortality may occur in areas burned by creeping piles. All piled vegetation is completely consumed.</p>

Activity Component		Work Element		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-treatment Vegetation Description
II	Oak woodland/oak-maple/ interior chaparral/ mountain brush	Dense homogenous stands of woodland or shrub with very little to no understory or overstory tree vegetation. Only natural fuels are on-site; few to no activity fuels are on-site. Dominant species of woodland and shrub may include: Gambel's oak, bigtooth maple, mountain mahogany, serviceberry, snowberry, bitterbrush, manzanita, ceanothus, silk tassle, madrone or other evergreen oaks.	Broadcast burn	<p>Common to all treatment intensities: If objectives are to reduce woodland or shrub densities over time, successive years of burning may be needed to deplete vegetative reserves and reduce future sprouting. Almost all large woody debris and snags are absent since they likely did not occur in the overstory.</p> <p>Low Treatment Intensity - Broadcast burning will create patches of burned and unburned areas (less than 50% of the area burned). Partial to complete vegetative consumption will occur in burned patches. Soil heating will be of relatively short duration; where burning occurs, there will be low to moderate ground scorch severity. Prolific and vigorous woodland/shrub sprouting will occur in the burned patches shortly following burning.</p> <p>Moderate Treatment Intensity - Broadcast burning will create patches of burned and unburned areas, with more burned patches (up to 75% of the area burned). Partial to complete vegetative consumption will occur in burned patches. Soil heating will be of moderate duration; where burning occurs, there will be low to moderate ground scorch severity. Prolific and vigorous woodland/shrub sprouting will occur in the burned patches shortly following burning.</p> <p>High Treatment Intensity - Broadcast burning will occur over all of the landscape. Complete vegetative consumption will occur across the entire treated area. Soil heating will be of moderate duration; where burning occurs, there will be moderate to high ground scorch severity. Prolific and vigorous woodland/shrub sprouting will occur across the burned area shortly following burning.</p>

Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, and lodgepole pine cover types occupying historical Fire Regime Group I and III

Tree species distribution:

- Ponderosa pine (*Pinus ponderosa* var. *ponderosa* and/or var. *scopulorum*) and Douglas-fir (*Pseudotsuga menziesii* mostly var. *glauca*, but some var. *menziesii* on the western edge) occur in all seven states involved in this process.
- Western Larch (*Larix occidentalis*) occurs in Western Montana, Northern Idaho, Eastern Washington and Oregon.
- Jeffrey pine (*Pinus jeffreyi*) may occur in Southwestern Oregon and Western Nevada.
- Lodgepole pine (*Pinus contorta* var. *latifolia*) occurs in all seven states involved in this process.

Fire regimes:

Fire regimes used in these tables are the same fire regime groups as those used in Restoring Fire-Adapted Ecosystems on Federal Lands, A Cohesive Fuel Treatment Strategy for Protecting People and Sustaining Natural Resources (USDI and USDA Forest Service, August 2, 2002). Fire regime is the natural historical frequency and severity of fire within an ecosystem.

Fire-Prone Areas Targeted:

“The cohesive Strategy places a greater emphasis on restoration and fuel maintenance treatments within these areas most prone to fire occurrence, specifically within Fire Regime Groups I, II, and III. These areas have experienced the greatest change from historical conditions due to fire exclusion. Thus, they are most likely to respond favorably to treatments designed to reduce hazardous fuels, thereby improving ecosystem resiliency to wildland fire” (Restoring Fire-Adapted Ecosystems on Federal Lands, A Cohesive Fuel Treatment Strategy for Protecting People and Sustaining Natural Resources, USDI and USDA Forest Service, August 2, 2002, pg 28). Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, and lodgepole pine are common forest overstory species in Fire Regime Groups I and III, and will likely comprise a majority of the restoration project proposals in conifer ecosystems.

Restoration activities will vary greatly depending on landscapes and site specific conditions. Some treatment proposals may seek to restore forest structure in one treatment, and other proposals may plan for multiple activities spread over 5 to 20 years, depending on other resource values involved.

Lodgepole pine or grand fir were not historically the dominant cover type in these fire regimes, but due to past management actions, they may now be the dominant overstory on some Fire Regime Group I or III areas. These coniferous forests types may merge into Sagebrush plant communities, especially in fire regime I and sometimes in fire regime III.

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
I	<p>Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, lodgepole pine</p> <p>*Due to fire exclusion, timber harvesting, or insect and disease, lodgepole pine or grand fir may now be the <i>primary</i> (overstory and understory) tree species on these sites.</p>	<p>Overstory of ponderosa pine, or western larch, Jeffrey pine, or Douglas-fir (or in combinations). In this treatment most of the smaller diameter, understory trees are thinned and piled.</p> <p>Due to past timber harvest or insect and disease activity, large diameter trees may no longer be present on the areas. Due to their higher value, ponderosa pine, western larch, or Douglas-fir may have been selectively harvested, leaving lodgepole pine (or grand fir) as the current primary overstory tree species.</p>	<p>Thin, pile, and burn piles – This includes machine thinning and machine piling, hand thinning and hand piling, and combinations of the above treatments.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: Native understory plants that have the ability to sprout and will begin to sprout shortly following spring and early fall burns if soil moisture and temperature conditions are conducive to plant growth. In burned areas, 95% of the fine and small diameter fuels (one hour [0 to 0.25" diameter], 10 hour [0.25 to 1.0"], and 100 hour [1 to 3"]) will be consumed. Large diameter fuels (1,000 hour [3"+]) will be consumed in relation to their diameter and moisture content. The lower the moisture content of the larger fuels the greater the mass consumed. Up to 20% of the treatment area (area under the piles) may have severe soil heating (up to several inches into the soil profile).</p> <p>Low Treatment Intensity: Scorch damage on 20% of the trees in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 40% of treatment area burned). Immediate post fire mortality of the overstory will be less than 10% of the basal area per acre.</p> <p>Moderate Treatment Intensity: Scorch damage on 20-50% of the trees in the immediate vicinity of the burned piles. 20-50% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (Up to 70% of total treatment area burned). Immediate post fire mortality of the overstory will be less than 20% of the basal area per acre.</p> <p>High Treatment Intensity: Scorch damage on more than 50% of the trees in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch. More than 50% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (More than 70% of total treatment area is burned). Immediate post fire mortality of the overstory will be less than 25% of the basal area per acre.</p> <p>Riparian areas: Most riparian areas will be treated with low intensity treatment, but due to thick duff accumulations or other fuel arrangements, some portions (generally less than 20%) of the riparian area may experience effects equivalent to moderate treatment intensity. Some variation in fire effects is natural and healthy for producing functioning ecosystems.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
I	<p>Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, lodgepole pine</p> <p>*Due to fire exclusion, timber harvesting, or insect and disease, lodgepole pine or grand fir may now be the <i>primary</i> (overstory and understory) tree species on these sites.</p>	<p>Overstory of ponderosa pine, or western larch, Jeffrey pine, or Douglas-fir (or in combinations). In this treatment most of the smaller diameter, understory trees are thinned and left where they fall, or the thinned trees may be scattered to avoid concentrations of thinning slash.</p> <p>Due to past timber harvest or insect and disease activity, large diameter trees may no longer be present on the areas. Due to their higher value, ponderosa pine, western larch, or Douglas-fir may have been selectively harvested, leaving lodgepole pine as the <i>current</i> primary overstory tree species.</p>	<p>Thin, scatter, and broadcast burn - This includes machine thinning, and hand thinning and combinations there-of. In some cases, fuels may be pulled away from the designated leave trees or other important resources.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Common to all treatment intensities: Native understory plants that have the ability to sprout, will begin to sprout shortly following spring and early fall burns. In burned areas, 90% of the fine fuels (one hour [0 to 0.25"] and 10 hour [0.25 to 1.0" diameter]) will be consumed. Large diameter fuels (100 hour [1 to 3"] and 1,000 hour [3"+]) will be consumed in relation to their diameter and moisture content. The lower the moisture content of the larger fuels the greater the mass consumed.</p> <p>Low Treatment Intensity: Scorch damage on up to 40% of the trees. Up to 50% of the area has been burned (low to moderate severity). Immediate post fire mortality of the overstory will be less than 10% of the basal area per acre.</p> <p>Moderate Treatment Intensity: Scorch damage on 20-50% of the trees. Up to 70% of the area has been burned (mostly low to moderate, but some high severity). Immediate post fire mortality of the overstory will be less than 20% of the basal area per acre.</p> <p>High Treatment Intensity: Scorch damage on more than 50% of the trees. More than 80% of the area has been burned (low, moderate, and some high severity). Immediate post fire mortality of the overstory will be less than 25% of the basal area per acre.</p> <p>Riparian areas: Most riparian areas will be treated with low intensity treatment, but due to thick duff accumulations or other fuel arrangements, some portions (generally less than 20%) of the riparian area may experience effects equivalent to moderate treatment intensity. Some variation in fire effects is natural and healthy for producing functioning ecosystems.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
I	<p>Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, lodgepole pine</p> <p>Due to fire exclusion, timber harvesting, or insect and disease, lodgepole pine or grand fir may now be the <i>primary</i> (overstory and understory) tree species on these sites.</p>	<p>Overstory of ponderosa pine, Jeffrey pine, or western larch, or Douglas-fir (or in combinations).</p> <p>Due to past timber harvest or insect and disease activity, large diameter trees may no longer be present on the areas.</p> <p>In many cases, the <i>current</i> tree biomass may far exceed the biomass that would have been maintained on these sites naturally. Therefore, treatments may be designed to kill much of the understory trees and even significant portions of the overstory trees.</p>	<p>Broadcast burn</p> <p>In some cases, this may include fuels being pulled away from the designated leave trees or other important resources.</p>	<p>Common to all treatment intensities: Native understory plants that have the ability to sprout, will begin to sprout shortly following spring and early fall burns. In burned areas, 90% of the fine fuels (one hour [0 to 0.25"] and 10 hour [0.25 to 1.0" diameter]) will be consumed. Large diameter fuels (100 hour [1 to 3"] and 1,000 hour [3"+]) will be consumed in relation to their diameter and moisture content. The lower the moisture content of the larger fuels the greater the mass consumed.</p> <p>Low Treatment Intensity: Scorch damage on up to 40% of the overstory trees. Up to 50% of the area has been burned (low to moderate severity). Immediate post fire mortality of the overstory will be less 20% of the basal area per acre.</p> <p>Moderate Treatment Intensity: Scorch damage on 20-50% of the overstory trees. Up to 70% of the area has been burned (mostly low to moderate, but some high severity). Immediate post fire mortality of the overstory will be less than 30% of the basal area per acre.</p> <p>High Treatment Intensity: Scorch damage on more than 50% of the trees. More than 80% of the area has been burned (low, moderate, and some high severity). Immediate post fire mortality of the overstory will be less than 40% of the basal area per acre.</p> <p>Riparian areas: Most riparian areas will be treated with low intensity treatment, but due to thick duff accumulations or other fuel arrangements, some portions (generally less than 20%) of the riparian area may experience effects equivalent to moderate treatment intensity. Some variation in fire effects is natural and healthy for producing functioning ecosystems.</p>

Ponderosa pine, Douglas-fir, Western Larch, Jeffrey Pine, Lodgepole pine – Open Forest Objective Prescribed Fire Effects

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	<p>Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, lodgepole pine – Open Forest Objective</p> <p>Mosaics of different forest structure are part of the landscape patterns for this regime. Much of this regime had surface fires frequent enough to result in open forests with trees of medium and large diameter. Closed and multi-story forest and seedling/sapling structures were also represented in this regime.</p> <p>* Due to fire exclusion, timber harvesting, or insect and disease, lodgepole pine or grand fir may now be the primary (overstory and understory) tree species on these sites.</p>	<p>Overstory of ponderosa pine, Jeffrey pine, or western larch, or Douglas-fir (or in combinations). Most of the smaller diameter, understory trees and piled or scattered.</p> <p>Due to past timber harvest or insect and disease activity, large diameter trees may no longer be present on the areas. Due to their higher value, ponderosa pine, western larch, or Douglas-fir may have been selectively harvested, leaving lodgepole pine (or grand fir) as the <i>current</i> primary overstory tree species.</p>	<p>Thin, pile and burn piles to achieve open forest structure as a result of a non-lethal or mixed lethal severity disturbance.</p> <p>Treatment type and size should be based on landscape objectives considering the natural mosaic of patches of forest structure and within stand variation.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>After reviewing the forest structure of a landscape, it may be necessary to restore an open large tree forest structure component in that landscape. This would be accomplished with prescribed fire with an end result of non-lethal or mixed lethal fire effects.</p> <p>Common to all treatment intensities: Native understory plants that have the ability to sprout, will sprout following spring and early fall burns. In burned areas, 95% of the fine and small diameter fuels (one hour [0 to 0.25" diameter], 10 hour [0.25 to 1.0"], and 100 hour [1 to 3"])] will be consumed. Large diameter fuels (1,000 hour [3"+]) will be consumed in relation to their diameter and moisture content. The lower the moisture content of the larger fuels the greater the mass consumed. Up to 20% of the treatment area (area under the piles) may have severe soil heating (up to several inches into the soil profile).</p> <p>Low Treatment Intensity: Scorch damage on 20% of the trees in the immediate vicinity of the burned piles. Up to 20% of the area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 40% of treatment area burned). Immediate post fire mortality of the overstory will be less than 10% of the basal area per acre.</p> <p>Moderate Treatment Intensity: Scorch damage on 20-50% of the trees in the immediate vicinity of the burned piles. 20-50% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (Up to 70% of total treatment area burned). Immediate post fire mortality of the overstory will be less than 20% of the basal area per acre.</p> <p>High Treatment Intensity: Scorch damage on more than 50% of the trees in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch. More than 50% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (More than 70% of total treatment area is burned). Immediate post fire mortality of the overstory will be less than 25% of the basal area per acre.</p> <p>Riparian areas: Most riparian areas will be treated with low intensity treatment, but due to thick duff accumulations or other fuel arrangements, some portions (generally less than 20%) of the riparian area may experience effects equivalent to moderate treatment intensity.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	<p>Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, lodgepole pine – Open Forest Objective</p> <p>Due to fire exclusion, timber harvesting, or insect and disease, lodgepole pine or grand fir may now be the primary (overstory and understory) tree species on these sites.</p>	<p>Overstory of ponderosa pine, Jeffrey pine, or western larch, or Douglas-fir (or in combinations).</p> <p>Due to past timber harvest or insect and disease activity, large diameter trees may no longer be present on the areas. Due to their higher value, ponderosa pine, western larch, or Douglas-fir may have been selectively harvested, leaving lodgepole pine (or grand fir) as the <i>current</i> primary overstory tree species.</p>	<p>Broadcast burn - to achieve open forest structure (as a result of a non-lethal or mixed lethal severity disturbance).</p> <p>In some cases, this may include fuels being pulled away from the designated leave trees or other important resources.</p>	<p>Common to all treatment intensities: Native understory plants that have the ability to sprout, will begin to sprout shortly following spring and early fall burns. In burned areas, 90% of the fine fuels (one hour [0 to 0.25"] and 10 hour [0.25 to 1.0" diameter]) will be consumed. Large diameter fuels (100 hour [1 to 3 "] and 1,000 hour [3+"]) will be consumed in relation to their diameter and moisture content. The lower the moisture content of the larger fuels the greater the mass consumed.</p> <p>Low Treatment Intensity: Scorch damage on up to 40% of the overstory trees. Up to 50% of area has been burned (low to moderate severity). Immediate post fire mortality of the overstory will be less 20% of the basal area per acre.</p> <p>Moderate Treatment Intensity: Scorch damage on 20-50% of the overstory trees. Up to 70% of the area has been burned (mostly low to moderate, but some high severity). Immediate post fire mortality of the overstory will be less than 30% of the basal area per acre.</p> <p>High Treatment Intensity: Scorch damage on more than 50% of the trees. More than 80% of the area has been burned (low, moderate, and some high severity). Immediate post fire mortality of the overstory will be less than 40% of the basal area per acre.</p> <p>Riparian areas: Most riparian areas will be treated with low intensity treatment, but due to thick duff accumulations or other fuel arrangements, some portions (generally less than 20%) of the riparian area may experience effects equivalent to moderate treatment intensity.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	<p>Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, lodgepole pine – Open Forest Objective</p> <p>Mosaics of different forest structure are part of the landscape patterns for this regime. Much of this regime had surface fires frequent enough to result in open forests with trees of medium and large diameter. Closed and multi-story forest and seedling/sapling structures were also represented in this regime.</p> <p>* Due to fire exclusion, timber harvesting, or insect and disease, lodgepole pine or grand fir may now be the <i>primary</i> (overstory and understory) tree species on these sites.</p>	<p>Overstory of ponderosa pine, Jeffrey pine, or western larch, or Douglas-fir (or in combinations). Most of the smaller diameter, understory trees have been cut and piled or scattered.</p> <p>Due to past timber harvest or insect and disease activity, large diameter trees may no longer be present on the areas. Due to their higher value, ponderosa pine, western larch, or Douglas-fir may have been selectively harvested, leaving lodgepole pine (or grand fir) as the <i>current</i> primary overstory tree species.</p>	<p>Thin, scatter and burn to achieve open forest structure as a result of a non-lethal or mixed lethal severity disturbance.</p> <p>Treatment type and size should be based on landscape objectives considering the natural mosaic of patches of forest structure and within stand variation.</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>After reviewing the forest structure of a landscape, it may be necessary to restore an open large tree forest structure component in that landscape. This would be accomplished with prescribed fire with an end result of non-lethal or mixed lethal fire effects.</p> <p>Common to all treatment intensities: Native understory plants that have the ability to sprout, will begin to sprout shortly following spring and early fall burns. In burned areas, 90% of the fine fuels (one hour [0 to 0.25"] and 10 hour [0.25 to 1.0" diameter]) will be consumed. Large diameter fuels (100 hour [1 to 3 "] and 1,000 hour [3+"]) will be consumed in relation to their diameter and moisture content. The lower the moisture content of the larger fuels the greater the mass consumed.</p> <p>Low Treatment Intensity : Scorch damage on up to 40% of the trees. Up to 50% of area has been burned (low to moderate severity). Immediate post fire mortality of the overstory will be less than 10% of the basal area per acre.</p> <p>Moderate Treatment Intensity: Scorch damage on 20-50% of the trees. Up to 70% of the area has been burned (mostly low to moderate, but some high severity). Immediate post fire mortality of the overstory will be less than 20% of the basal area per acre.</p> <p>High Treatment Intensity: Scorch damage on more than 50% of the trees. More than 80% of the area has been burned (low, moderate, and some high severity). Immediate post fire mortality of the overstory will be less than 25% of the basal area per acre.</p> <p>Riparian areas: Most riparian areas will be treated with low intensity treatment, but due to thick duff accumulations or other fuel arrangements, some portions (generally less than 20%) of the riparian area may experience effects equivalent to moderate treatment intensity. Some variation in fire effects is natural and healthy for producing functioning ecosystems.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	<p>Ponderosa pine, Douglas-fir, western larch, Jeffrey pine, lodgepole pine – Seedling/Sapling Objective</p> <p>Mosaics of different forest structure are part of the landscape patterns for this regime. Much of this regime had surface fires frequent enough to result in open forests of medium and large diameter trees. Closed and multi-story forest and seedling/sapling structures were also represented in this regime.</p>	<p>Includes a wide range of fuel and forest stand conditions. May include areas which have had trees cut down to generate dry fuels to burn to produce enough heat to kill most of the trees in both the overstory and understory.</p> <p>Stands may typically be well stocked, having dense canopy cover of single or multistory trees.</p>	<p>Broadcast burn - to achieve seedling/sapling forests (as a result of a stand replacing disturbance).</p> <p>It may be necessary to restore seedling and sapling patches and pole size patches across the landscape to restore a natural mosaic pattern. This would be accomplished with prescribed fire with an end result of lethal fire effects.</p> <p>Treatment type and size should be based on landscape objectives considering the natural mosaic of patches of forest structure and within stand variation.</p>	<p>High Treatment Intensity: Scorch damage or basal injury on more than 90% of the trees. More than 80% of the area has been burned (moderate and high severity). Immediate post fire mortality of the overstory will be 85% or more of the basal area per acre. Treatments of low or moderate intensity would generally not be planned with a stand replacing disturbance objective.</p> <p>Riparian areas: Most riparian areas will be treated with moderate intensity treatment, but due to thick duff accumulations or other fuel arrangements, some portions (generally less than 20%) of the riparian area may experience effects equivalent to moderate treatment intensity.</p>

Riparian Mid/Upper Elevations Prescribed Fire Effects

Activity Component		Pre-Treatment Vegetation Description	Treatment Type	Work Element
Fire Regime	Existing Vegetation Type			Post-treatment Vegetation Description
III, IV & V Highly variable but generally longer intervals and high severity	Riparian Mid/Upper Elevations, Condition Class 1 Exist throughout lodgepole pine, cedar, spruce, fir type in the area	Condition Class 1 – Area includes only riparian vegetation – not entire RHCA. Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large pole to mature size lodgepole pine, Douglas-fir, western larch, white pine, hardwoods, spruce, western hemlock, cedar or true fir. Understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are up to 5 snags per acre present.	Thin small diameter trees, Hand pile, burn piles See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning. See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.	<p>Piling is the treatment most likely to have effects in riparian due to higher fuel moistures. Piling and pile covers facilitate drying of fuels and help to increase consumption.</p> <p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, climax species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance. Consumption of duff will be dependent on moisture content. Movement of fire outside of the perimeter of the pile may occur during “creeping.” Total consumption of the duff layer will only occur under extremely dry forest floor conditions, or in areas where heating is great.</p> <p>Low Treatment Intensity - Scorch damage on up to 10% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned). Most likely to occur in areas where fuel moistures, dead and live, are high</p> <p>Moderate Treatment Intensity - Scorch damage on 10-20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 20% of the trees in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

Activity Component			Work Element	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-treatment Vegetation Description
III, IV & V	Riparian Mid/Upper Elevations, Condition Class 1	Condition Class 1 – Area includes only riparian vegetation – not entire RHCA. Stand has not missed any past fire disturbance cycles but is nearing or at maturity. More seral species than higher condition classes. Large pole to mature size lodgepole pine, Douglas fir, western larch, white pine, hardwoods, spruce, true fir, cedar or western hemlock. Understory conifers scattered throughout unit. Other understory vegetation includes grasses, forbs, and shrubs. Snags are low in number - up to 5 snags per acre present.	<p>Broadcast Burn (thinned or not)</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p>	<p>Intentional burning in riparian areas is often not an objective. However, fire can creep into riparian area from upland burns. Often this creeping does not result in the same degree of impacts as in the upland area due to higher fuel moistures.</p> <p>Low Treatment Intensity - Up to 10% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees are likely killed through cambial heating or scorching. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperatures are conducive to plant growth. Up to 20% of snags and up to 30% of large downed logs heavily damaged or burned up. Most likely scenario at mid to upper elevations.</p> <p>Moderate Treatment Intensity - 10-30% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorching damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorching. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moisture and temperatures are conducive for plant growth. Up to 30% of snags and up to 50% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorching. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moisture and temperatures are conducive for plant growth. Up to 50% of snags and up to 70% of large downed logs heavily damaged or burned up.</p>

Activity Component		Pre-Treatment Vegetation Description	Treatment Type	Work Element
Fire Regime	Existing Vegetation Type			Post-treatment Vegetation Description
III, IV & V	Riparian Mid/Upper Elevations, Condition Class 2	Condition Class 2 – Area includes only riparian vegetation – not entire RHCA. Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over- mature spruce, cedar, western hemlock, true fir, lodgepole pine, Douglas fir, western larch or white pine. Most small diameter, understory true fir, spruce and hemlock trees have been cut and piled. Remaining understory trees are scattered throughout the treatment area and dominated by shade-tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present.	<p>Thin small diameter trees, hand pile, burn piles</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Piling is the treatment most likely to have effects in riparian due to higher fuel moistures. Piling and pile covers facilitate drying of fuels and increases consumption.</p> <p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, late seral species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance due to serotinous cones and bare soil. Consumption of duff will be dependent on moisture content. Movement of fire outside of the perimeter of the pile may occur during “creeping.” Total consumption of the duff layer will only occur under extremely dry forest floor conditions, or in areas where heating is great.</p> <p>Low Treatment Intensity - Scorch damage on 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned).</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered and burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless large and close). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 60% of total treatment area burned).</p>

Activity Component		Pre-Treatment Vegetation Description	Treatment Type	Work Element
Fire Regime	Existing Vegetation Type			Post-treatment Vegetation Description
III, IV & V	Riparian Mid/Upper Elevations, Condition Class 2	Condition Class 2 – Area includes only riparian vegetation – not entire RHCA. Stand has missed 1 or more past fire disturbance cycles and is past maturity with shade-tolerant species increasing. Large diameter, over- mature spruce, cedar, western hemlock, true fir, lodgepole pine, Douglas fir, western larch or white pine. Most small diameter, understory true fir, spruce and hemlock trees have been cut and scattered. Remaining understory trees are scattered throughout the treatment area and dominated by tolerant, late seral species. Other understory vegetation includes grasses, forbs, and shrubs. Up to 15-20 snags per acre present.	Broadcast Burn (thinned or not) See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.	<p>Intentional burning in riparian areas is often not an objective. However, fire can creep into riparian area from upland burns. Often this creeping does not result in the same degree of impacts as in the upland area due to higher fuel moistures, etc.</p> <p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moistures and temperatures are conducive for plant growth. Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks if soil moistures and temperatures are conducive for plant growth. Up to 40% of snags and up to 60% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 30-50% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but sprouting evident within a few days to up to 3 weeks soil moisture and temperatures are conducive for plant growth. Up to 60% of snags and up to 80% of large downed logs heavily damaged or burned up.</p>

Activity Component		Pre-Treatment Vegetation Description	Treatment Type	Work Element
Fire Regime	Existing Vegetation Type			Post-treatment Vegetation Description
III, IV & V	Riparian Mid/Upper Elevations, Condition Class 3	Condition Class 3 – Area includes only riparian vegetation – not entire RHCA. Stand has missed many past fire disturbance cycles and has converted to true firs, western hemlock, and shade-tolerant species. More late seral species present without disturbance that are more sensitive to fire. Large diameter true fir, spruce, cedar or western hemlock dominates with remnant Douglas fir, western larch, lodgepole pine, or western white pine scattered. Pathogens and insects have increased damage to trees and have created excessive fuels and many piles. Most understory trees have been cut and piled with remaining understory trees scattered throughout the treatment area and dominated by true fir, spruce and western hemlock. Other understory vegetation includes native grasses, forbs, and shrubs. Over 20 snags per acre.	<p>Thin small diameter trees, Hand pile, burn piles</p> <p>See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.</p> <p>See Mechanical Treatment Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component for information related to piling.</p>	<p>Piling is the treatment most likely to have effects in riparian due to higher fuel moistures. Piling and pile covers enable fuels to dry out and be more completely consumed than fuels scattered on ground.</p> <p>Common to all treatment intensities: 95% of piles are completely consumed. Up to 20% of the treatment area (area directly under the piles) will have severe soil heating up to several inches into the soil profile. Western larch, ponderosa pine & Douglas fir less sensitive to fire than lodgepole pine, climax species are most sensitive & most likely to die. Lodgepole pine regenerates easily after disturbance. Consumption of duff will be dependent on moisture content. Movement of fire outside of the perimeter of the pile may occur during “creeping.” Total consumption of the duff layer will only occur under extremely dry forest floor conditions, or in areas where heating is great.</p> <p>Low Treatment Intensity - Scorch damage on up to 20% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. Up to 20% of area has been burned (low to moderate severity) from fire creeping outside the pile boundaries (total of 20% of treatment area burned).</p> <p>Moderate Treatment Intensity - Scorch damage on 20-30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles. 20-30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 40% of total treatment area burned).</p> <p>High Treatment Intensity - Not likely (at mid to upper elevations) since piles are normally covered & burned late in the season before winter or early spring. Scorch damage on more than 30% of the trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) in the immediate vicinity of the burned piles with limited immediate mortality from 100% scorch depending on where and how large piles are (less chance unless piles are large and close to one another). More than 30% of the area beyond the piles burned (low to moderate severity) from fire creeping outside of pile boundaries (up to 50% of total treatment area burned).</p>

Activity Component		Work Element		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-treatment Vegetation Description
III, IV & V	Riparian Mid/Upper Elevations, Condition Class 3	Condition Class 3 – Area includes only riparian vegetation – not entire RHCA. Stand has missed many past fire disturbance cycles and has converted to true firs, western hemlock and shade-tolerant species. More climax species present without disturbance that are more sensitive to fire. Large diameter true fir, spruce, cedar or western hemlock dominates with remnant Douglas fir, western larch, lodgepole pine, or western white pine scattered. Pathogens and insects have increased damage to trees and created excessive fuels and accumulations. Most understory trees have been cut, remaining understory trees are scattered throughout treatment area & are dominated by true fir, spruce & western hemlock. Other understory vegetation includes native grasses, forbs & shrubs. Over 20 snags per acre present.	Broadcast Burn (thinned or not) See Mechanical Treatment Activity Type, Harvest Prescription / Implementation Activity Component for information related to thinning.	<p>Intentional burning in riparian areas is often not an objective. However, fire can creep into riparian area from upland burns. Often this creeping does not result in the same degree of impacts as in the upland area due to higher fuel moistures.</p> <p>Low Treatment Intensity - Up to 20% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating, but relatively little scorch damage on other overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moistures and temperatures are conducive to plant growth . Up to 30% of snags and up to 40% of large downed logs heavily damaged or burned up.</p> <p>Moderate Treatment Intensity - 20-40% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate scorch damage on most of remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moistures and temperatures are conducive for growth. Up to 40% of snags & up to 60% of large downed logs heavily damaged or burned up.</p> <p>High Treatment Intensity - 40-60% of remaining overstory trees (primarily fire sensitive species such as true firs, hemlock, spruce and other species when younger) killed by crown scorch damage or cambial heating with moderate-high scorch damage on almost all remaining overstory trees. Remaining fire sensitive understory trees likely killed through cambial heating or scorch. Other understory vegetation top-killed but resprouting evident within a few days to up to 3 weeks if soil moistures and temperatures are conducive for growth. Up to 60%+ of snags and up to 80%+ of large downed logs heavily damaged or burned up.</p>

Sagebrush Prescribed Fire Effects – General Descriptions and Trends

Sagebrush is usually the dominant shrub in drier ecosystems of the Intermountain Region and the Great Basin. Elevation of sagebrush communities varies from 300 ft above sea level in the Columbia Basin to over 10,000 ft in the mountains of the Great Basin. Sagebrush plant communities occupy just over 155 million acres in the western United States. These shrub-steppe plant communities are characterized by an overstory of sagebrush (*Artemisia* sp.) and an understory of perennial grasses and forbs. As effective precipitation decreases, the herbaceous plants total a smaller percentage of the total plant cover. Vegetal cover is usually not continuous and large areas of bare ground can occur. Potential composition of the associated vegetation is dependent on the local and regional climate as well as soil type. A large number of herbaceous species are present throughout the sagebrush biome, but relatively few species form the bulk of the biomass.

Fire regimes of these plant communities are variable. However, there are some general patterns. In all cases fires would be classified as stand replacing based on the accepted definition. Fires are either mixed or high severity. The average number of years between fire events will increase as the site conditions become drier. Higher elevation mountain big sagebrush plant communities may experience a fire once every 15 to 25 years and a lower elevation Wyoming big sagebrush plant community may not experience a fire event once in 100 years. Over the last 150 years, most big sagebrush plant communities within the range of consideration have missed at least one fire cycle. Higher elevation sagebrush plant communities may have missed as many as 3-4 cycles. The exception to this is where annual grasses, primarily cheatgrass, have come to dominate the site. These areas have shifted to a fire regime with very frequent fires. In some cases these annual grass dominated sites burn once every 3-5 years.

Eleven species and 14 subspecies of sagebrush have been identified in the western United States. Three subspecies of big sagebrush (*Artemisia tridentata*) are described in the text and table below.

Wyoming Big Sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) occurs throughout the area under consideration. Site productivity affects species composition and stature. Highly productive sites have greater plant density and more biomass than drier areas. Wyoming big sagebrush is the least flammable of the three big sagebrush species described. Soils are often shallow, well drained with a fine texture. The invasive annual, cheatgrass (*Bromus tectorum*) has made the most significant inroads into these big sagebrush plant communities.

Basin Big Sagebrush (*Artemisia tridentata* ssp. *tridentata*) occurs on sites that are more productive than Wyoming big sagebrush. Basin big sagebrush is considered to be intermediate in flammability to Wyoming big and mountain big sagebrush. Soils are often deep and well drained. However, in the Great Basin, basin big sagebrush can be found on areas with shallow soils. The shrub will have similar physical and plant community structural characteristics to Wyoming big sagebrush under these conditions.

Mountain Big Sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is often found on productive, higher elevation sites. Mountain big sagebrush is the most flammable of the three subspecies. Soils are deep and well drained. Herbaceous plants comprise a larger proportion of the late seral plant communities than in the Wyoming or basin big sagebrush plant communities.

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
II	Mountain Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>)	Mountain big sagebrush is either dominant or co-dominant with other understory grasses and forbs. Sagebrush, and associated woody vegetation cover, varies from less than 10% to over 60%. At higher elevations, mountain big sagebrush exists with other mountain shrubs; bitterbrush, horsebrush, rabbitbrush, ceanothus, and snowberry. Sagebrush forms a relatively homogenous stand of woody vegetation of similar sized shrubs. As woody vegetation approaches the maximum allowable on site, understory vegetation cover and density is reduced with a corresponding increase in bare ground. Understory cover at this stage will be less than 10%.	Broadcast Burn	<p>Mountain big sagebrush plants are killed by fire. However, most associated woody vegetation is capable of sprouting following top removal. Sprouting ability varies across and within individual shrub species. Sprouting of antelope bitterbrush would represent a species with sporadic ability to sprout, and green rabbitbrush and snowberry would be classified as vigorous sprouters. Most shrubs found in these plant communities fall in the continuum between these species. Deep rooted perennial forbs and grasses also sprout vigorously following burning. Shallower rooted grasses and mat-forming forbs can be suppressed following burning. Small amounts of plant litter are present in these communities and are found beneath the canopies of shrubs or larger grasses and forbs. Cheatgrass does occur in disturbed areas of some these plant communities. However, areas where cheatgrass is a major component, or dominates the plant community is discussed elsewhere..</p> <p>Low Treatment Intensity – Fire has removed most of the leaves on the shrubs and the smaller branches. Numerous blackened shrub skeletons are left standing. Aboveground portions of forbs and grasses are consumed. Plants with heavier leaves may have portions left intact. Large perennial grasses have blackened crowns. Green plant material may or may not have been consumed, especially within dense grass crowns. Litter on the soil surface, most commonly found beneath shrub canopies, is scorched to partially consumed.</p> <p>Moderate Treatment Intensity – Fire has removed all leaves and branches of shrubs. Only main stems and larger branches of dominant individuals in the stand remain. Aboveground portions of grasses and forbs are burned, but large plants may have recognizable parts blackened, but intact. Litter on soil surface (mostly beneath shrub canopies) is blackened and may be totally consumed in some areas.</p> <p>High Treatment Intensity – Fire has removed most of the above-ground portion of all shrubs grasses and forbs. Part of the shrub main stem may be present immediately following the fire. Most of the litter has been consumed by the fire and ash remains in the areas beneath shrubs. Crowns of grasses may be visible, but all live and dead plant material has been removed.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
II	Mountain Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>)	Mountain big sagebrush is either dominant or co-dominant with other understory grasses and forbs. Sagebrush, and associated woody vegetation cover, varies from less than 10% to over 60%. At higher elevations, mountain big sagebrush exists with other mountain shrubs; bitterbrush, horsebrush, rabbitbrush, ceanothus, and snowberry. Sagebrush forms a relatively homogenous stand of woody vegetation of similar sized shrubs. As woody vegetation approaches the maximum allowable on site, understory vegetation cover and density is reduced with a corresponding increase in bare ground. Understory cover at this stage will be less than 10%.	Brushbeating / mowing	<p>Brushbeating results in the severing/shredding of the upper portions of the shrubs. Big sagebrush does not sprout following removal of the aerial portions of the plant. However, associated shrubs sprout to varying degrees. Low growing herbaceous and woody plants can be missed by cutting blades. Treatment is often done in late fall when fire danger is low and the majority of plants are dormant. Brushbeating can also be done in winter or early spring if weather permits, or during other times when risk of fire is low. Cheatgrass does occur in disturbed areas of some these plant communities. However, areas where cheatgrass is a major component, or dominates these areas are discussed elsewhere.</p> <p>Low Treatment Intensity – Brushbeating occurs across less than 25% of the plant community. Cutting equipment is held at 18" above the soil surface. Only tops of larger shrubs are removed by cutters. Lower branches of larger shrubs and smaller shrubs are left intact. Minimal disturbance occurs to herbaceous plants. Some mechanical damage to herbaceous plants can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter is increased in interspace areas by cutting.</p> <p>Moderate Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held at 12-18" above the soil surface. The majority of larger shrubs have the tops removed. Sprouting of may be stimulated in shrubs other than mountain big sagebrush. Woody plants less than 12" tall are not damaged by the cutting blades. Most herbaceous plants are dormant during the treatment. Only aerial portions of herbaceous plants are removed by cutters, minimally impacting these plants. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter increases following treatment. Moderate amounts of woody litter are added to the soil surface. Some mechanical damage to herbaceous plants can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction.</p> <p>High Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held below 12" above the soil surface. Most shrubs have tops removed leaving a plant community. Sprouting shrubs will begin to send up shoots in the next growing season. Sagebrush is killed by treatments and will not sprout following top removal. Cutting blades remove aboveground herbaceous plant material at the level of the cutting blades. Some soil disturbance may occur due to cutting blades contacting the soils surface. Some mechanical damage can be done to herbaceous plants by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Large amounts of woody and herbaceous plant litter is added to the soil surface.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Mountain Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>)	These plant communities are at the warmer/drier end of the mountain big sagebrush distribution and may integrate into Wyoming big sagebrush plant communities as elevation and/or soil depth decreases. Mountain big sagebrush dominates in these drier plant communities. Rabbitbrush, horsebrush, and bitterbrush are commonly founding various levels in the plant community. Sagebrush cover and density have reached a point that understory herbaceous plants are being suppressed. Cover of herbaceous plants is less than 10%. Introduced annual plants may be present at various quantities. These plants may dominate the understory vegetation in areas with severe disturbance history.	Broadcast Burn	<p>Mountain big sagebrush plants are killed by fire. However, most associated woody vegetation is capable of sprouting following top removal. Sprouting ability varies across and within individual shrub species. Sprouting of antelope bitterbrush would represent a species with sporadic ability to sprout, and green rabbitbrush and snowberry would be classified as vigorous sprouters. Most shrub species fall in the continuum between these species. Deep rooted perennial forbs and grasses also sprout vigorously following burning. Shallower rooted grasses and mat-forming forbs can be suppressed following burning. Small amounts of plant litter are present in these communities. What is present is found beneath the canopies of shrubs or larger grasses and forbs. Cheatgrass does occur in disturbed areas of some these plant communities. However, areas where cheatgrass is a major component, or dominates these areas are discussed elsewhere.</p> <p>Low Treatment Intensity – Fire has removed most of the leaves on the shrubs and the smaller branches. Numerous blackened shrub skeletons are left standing. Aboveground portions of forbs and grasses are consumed. Plants with heavier leaves may have portions left intact. Large perennial grasses have blackened crowns. Green plant material may or may not have been consumed, especially within dense grass crowns. Litter on the soil surface, most commonly found beneath shrub canopies is scorched to partially consumed. If annual plants are present in significant quantities prior to burning they will potentially dominate the post treatment plant community.</p> <p>Moderate Treatment Intensity – Fire has removed all leaves and branches of shrubs. Only main stems and larger branches of dominant individuals in the stand remain. Aboveground portions of grasses and forbs are burned, but large plants may have recognizable parts blackened, but intact. Litter on soil surface (mostly beneath shrub canopies) is blackened and may be totally consumed in some areas. If annual plants are present in significant quantities prior to burning they will potentially dominate the post treatment plant community.</p>

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III	Mountain Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>)	These plant communities are at the warmer/drier end of the mountain big sagebrush distribution and may integrate into Wyoming big sagebrush plant communities as elevation and/or soil depth decreases. Mountain big sagebrush dominates in these drier plant communities. Rabbitbrush, horsebrush, and bitterbrush are commonly founding various levels in the plant community. Sagebrush cover and density have reached a point that understory herbaceous plants are being suppressed. Cover of herbaceous plants is less than 10%. Introduced annual plants may be present at various quantities. These plants may dominate the understory vegetation in areas with severe disturbance history.	Brushbeating / mowing	<p>Brushbeating results in the severing/shredding of the upper portions of the shrubs. Big sagebrush does not sprout following removal of the aerial portions of the plant. However, associated shrubs sprout to varying degrees. Low growing herbaceous and woody plants can be missed by cutting blades. Treatment is often done in late fall when fire danger is low and the majority of plants are dormant. Brushbeating can also be done in winter or early spring if weather permits. Cheatgrass does occur in disturbed areas of some these plant communities. However, areas where cheatgrass is a major component, or dominates these areas are discussed elsewhere.</p> <p>Low Treatment Intensity – Brushbeating occurs across less than 25% of the plant community. Cutting equipment is held at 18" above the soil surface. Only tops of larger shrubs are removed by cutters. Lower branches of larger shrubs and smaller shrubs are left intact. Minimal disturbance occurs to herbaceous plants. Some mechanical damage can be done to herbaceous plants by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter is increased in interspace areas by cutting. Annual plant density and cover will initially increase following treatment.</p> <p>Moderate Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held at 12-18" above the soil surface. The majority of larger shrubs have the tops removed. Sprouting of may be stimulated in shrubs other than mountain big sagebrush. Woody plants less than 12" tall are not damaged by the cutting blades. Most herbaceous plants are dormant during the treatment. Only aerial portions of herbaceous plants are removed by cutters, minimally impacting these plants. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter increases following treatment. Moderate amounts of woody litter are added to the soil surface. Some mechanical damage can be done to herbaceous plants by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction.</p> <p>High Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held below 12" above the soil surface. Most shrubs have tops removed leaving a plant community. Sprouting shrubs will begin to send up shoots in the next growing season. Sagebrush is killed by treatments and will not sprout following top removal. Cutting blades remove aboveground herbaceous plant material at the level of the cutting blades. Some soil disturbance may occur due to cutting blades contacting the soils surface. Some mechanical damage can be done to herbaceous plants by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction.</p>

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Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Wyoming Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>) – Intermountain West	Wyoming big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, bitterbrush and horsebrush are commonly found in association with Wyoming big sagebrush. Sagebrush and associated shrub cover and density will increase to the point where associated understory plant become suppressed. At maximum shrub cover and density, understory herbaceous plant cover would be less than 10% and bare ground would be greater than 65% of the total cover. Communities would have considerable diversity and are generally resilient to disturbance. Little to no invasive plant species present.	Broadcast Burn	<p>Wyoming big sagebrush plants are killed by fire. Associated woody vegetation is capable of sprouting following top removal. Sprouting ability varies across and within individual shrub species. Sprouting of antelope bitterbrush would represent a species with sporadic ability to sprout, and green rabbitbrush and horsebrush would be classified as vigorous sprouters. Most shrub species fall in the continuum between these species. Deep rooted perennial forbs and grasses also sprout vigorously following burning. Shallower rooted grasses and mat-forming forbs can be suppressed following burning. Small amounts of plant litter are present in these communities. What is present is found beneath the canopies of shrubs or larger grasses and forbs. Cheatgrass does occur in disturbed areas of some these plant communities. However, areas where cheatgrass is a major component, or dominates these areas are discussed elsewhere.</p> <p>Low Treatment Intensity – Fire has removed most of the leaves on the shrubs and the smaller branches. Numerous blackened shrub skeletons are left standing. Aboveground portions of forbs and grasses are consumed. Plants with heavier leaves may have portions left intact. Large perennial grasses have blackened crowns. Green plant material may or may not have been consumed, especially within dense grass crowns. Litter on the soil surface, most commonly found beneath shrub canopies is scorched to partially consumed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>Moderate Treatment Intensity – Fire has removed all leaves and branches of shrubs. Only main stems and larger branches of dominant individuals in the stand remain. Aboveground portions of grasses and forbs are burned, but large plants may have recognizable parts blackened, but intact. Litter on soil surface (mostly beneath shrub canopies) is blackened and may be totally consumed in some areas. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>High Treatment Intensity – Fire has removed most of the aboveground portion of all shrubs grasses and forbs. Part of the shrub main stem may be present immediately following the fire. Most of the litter has been consumed by the fire and ash remain in the areas beneath shrubs. Crowns of grasses may be visible, but all live and dead plant material has been removed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p>

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Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Wyoming Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>) – Intermountain West	These plant communities are at the warmer/drier end of the mountain big sagebrush distribution and may integrate into Wyoming big sagebrush plant communities as elevation and/or soil depth decreases. Mountain big sagebrush dominates in these drier plant communities. Rabbitbrush, horsebrush, and bitterbrush are commonly founding various levels in the plant community. Sagebrush cover and density have reached a point that understory herbaceous plants are being suppressed. Cover of herbaceous plants is less than 10%. Introduced annual plants may be present at various quantities. These plants may dominate the understory vegetation in areas with severe disturbance history.	Brushbeating / Mowing	<p>Brushbeating results in the severing/shredding of the upper portions of the shrubs. Big sagebrush does not sprout following removal of the aerial portions of the plant. However, associated shrubs sprout to varying degrees. Low growing herbaceous and woody plants can be missed by cutting blades. Treatment is often done in late fall when fire danger is low and the majority of plants are dormant. Brushbeating can also be done in winter or early spring if weather permits. Cheatgrass does occur in disturbed areas of some these plant communities. However, areas where cheatgrass is a major component, or dominates these areas are discussed elsewhere.</p> <p>Low Treatment Intensity – Brushbeating occurs across less than 25% of the plant community. Cutting equipment is held at 18" above the soil surface. Only tops of larger shrubs are removed by cutters. Lower branches of larger shrubs and smaller shrubs are left intact. Minimal disturbance occurs to herbaceous plants. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter is increased in interspace areas by cutting. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community.</p> <p>Moderate Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held at 12-18" above the soil surface. The majority of larger shrubs have the tops removed. Sprouting of may be stimulated in shrubs other than mountain big sagebrush. Woody plants less than 12" tall are not damaged by the cutting blades. Most herbaceous plants are dormant during the treatment. Only aerial portions of herbaceous plants are removed by cutters, minimally impacting these plants. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter increases following treatment. Moderate amounts of woody litter are added to the soil surface. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community.</p> <p>High Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held below 12" above the soil surface. Most shrubs have tops removed leaving a plant community. Sprouting shrubs will begin to send up shoots in the next growing season. Sagebrush is killed by treatments and will not sprout following top removal. Cutting blades remove aboveground herbaceous plant material at the level of the cutting blades. Some soil disturbance may occur due to cutting blades contacting the soils surface. Some mechanical damage can be done to herbaceous plants by passage of the tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Large amounts of woody and herbaceous plant litter is added to the soil surface. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community.</p>

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IV	Wyoming Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>)— Intermountain West	Wyoming big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, and horsebrush are commonly found in association with Wyoming big sagebrush. Bareground, or a combination of bareground and microbiotic soil crusts is usually greater than 65% in these dry communities. Communities would have considerable diversity and are generally resilient to disturbance. Little to no invasive weed species present. However, disturbance results in a period dominated by annual plants.	Broadcast Burn	<p>Wyoming big sagebrush plants are killed by fire. Associated woody vegetation is capable of sprouting following top removal. Sprouting ability varies across and within individual shrub species. Deep rooted perennial forbs and grasses also sprout vigorously following burning. Shallower rooted grasses and mat-forming forbs can be suppressed following burning. Small amounts of plant litter are present in these communities. What is present is found beneath the canopies of shrubs or larger grasses and forbs.</p> <p>Low Treatment Intensity – Fire has removed most of the leaves on the shrubs and the smaller branches. Numerous blackened shrub skeletons are left standing. Aboveground portions of forbs and grasses are consumed. Plants with heavier leaves may have portions left intact. Large perennial grasses have blackened crowns. Green plant material may or may not have been consumed, especially within dense grass crowns. Litter on the soil surface, most commonly found beneath shrub canopies is scorched to partially consumed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>Moderate Treatment Intensity – Fire has removed all leaves and branches of shrubs. Only main stems and larger branches of dominant individuals in the stand remain. Aboveground portions of grasses and forbs are burned, but large plants may have recognizable parts blackened, but intact. Litter on soil surface (mostly beneath shrub canopies) is blackened and may be totally consumed in some areas. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>High Treatment Intensity – Fire has removed most of the aboveground portion of all shrubs grasses and forbs. Part of the shrub main stem may be present immediately following the fire. Most of the litter has been consumed by the fire and ash remain in the areas beneath shrubs. Crowns of grasses may be visible, but all live and dead plant material has been removed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p>

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ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV	Wyoming Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>) – Great Basin	Wyoming big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, and horsebrush are commonly found in association with Wyoming big sagebrush. These Wyoming big sagebrush plant communities are often found adjacent or intermixed with salt desert plant communities. Salt Desert plant species may be found at low to moderate levels in these big sagebrush plant communities at the drier end of its distribution. Annual plants commonly dominate disturbed areas. Introduced annual and perennial plants have made significant encroachments into these plant communities. Bareground, or a combination of bareground and microbiotic soil crusts is usually greater than 75% in these dry communities. Total shrub cover would be between 10-15%. Introduced annual and perennial plants have made significant encroachments into these plant communities.	Broadcast Burn	<p>Wyoming big sagebrush plants are killed by fire. Associated woody vegetation is capable of sprouting following top removal. Sprouting ability varies across and within individual shrub species. Deep rooted perennial forbs and grasses also sprout vigorously following burning. Shallower rooted grasses and mat-forming forbs can be suppressed following burning. Small amounts of plant litter are present in these communities. Plant litter is often found concentrated beneath the canopies of larger grasses, forbs and shrubs.</p> <p>Low Treatment Intensity – Fire has removed most of the leaves on the shrubs and the smaller branches. Numerous blackened shrub skeletons are left standing. Aboveground portions of forbs and grasses are consumed. Plants with heavier leaves may have portions left intact. Large perennial grasses have blackened crowns. Green plant material may or may not have been consumed, especially within dense grass crowns. Litter on the soil surface, most commonly found beneath shrub canopies is scorched to partially consumed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>Moderate Treatment Intensity – Fire has removed all leaves and branches of shrubs. Only main stems and larger branches of dominant individuals in the stand remain. Aboveground portions of grasses and forbs are burned, but large plants may have recognizable parts blackened, but intact. Litter on soil surface (mostly beneath shrub canopies) is blackened and may be totally consumed in some areas. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>High Treatment Intensity – Fire has removed most of the aboveground portion of all shrubs grasses and forbs. Part of the shrub main stem may be present immediately following the fire. Most of the litter has been consumed by the fire and ash remain in the areas beneath shrubs. Crowns of grasses may be visible, but all live and dead plant material has been removed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV	Wyoming Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>) – Great Basin	Wyoming big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, and horsebrush are commonly found in association with Wyoming big sagebrush. These Wyoming big sagebrush plant communities are often found adjacent or intermixed with salt desert plant communities. Salt Desert plant species may be found at low to moderate levels in these big sagebrush plant communities at the drier end of its distribution. Annual plants commonly dominate disturbed areas. Introduced annual and perennial plants have made significant encroachments into these plant communities. Bareground, or a combination of bareground and microbiotic soil crusts is usually greater than 75% in these dry communities. Total shrub cover would be between 10-15%. Introduced annual and perennial plants have made significant encroachments into these plant communities.	Brushbeating / Mowing	<p>Brushbeating results in the severing/shredding of the upper portions of the shrubs. Big sagebrush does not sprout following removal of the aerial portions of the plant. However, associated shrubs sprout to varying degrees. Low growing herbaceous and woody plants can be missed by cutting blades. Treatment is often done in late fall when fire danger is low and the majority of plants are dormant. Brushbeating can also be done in winter or early spring if weather permits.</p> <p>Low Treatment Intensity – Brushbeating occurs across less than 25% of the plant community. Cutting equipment is held at 18" above the soil surface. Only tops of larger shrubs are removed by cutters. Lower branches of larger shrubs and smaller shrubs are left intact. Minimal disturbance occurs to herbaceous plants. Some mechanical damage can be done to herbaceous plants by passage of the tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter is increased in interspace areas by cutting. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community.</p> <p>Moderate Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held at 12-18" above the soil surface. The majority of larger shrubs have the tops removed. Sprouting of may be stimulated in shrubs other than mountain big sagebrush. Woody plants less than 12" tall are not damaged by the cutting blades. Most herbaceous plants are dormant during the treatment. Only aerial portions of herbaceous plants are removed by cutters, minimally impacting these plants. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter increases following treatment. Moderate amounts of woody litter are added to the soil surface. Some mechanical damage can be done to herbaceous plants by passage of the tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community.</p> <p>High Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held below 12" above the soil surface. Most shrubs have tops removed leaving a plant community. Sprouting shrubs will begin to send up shoots in the next growing season. Sagebrush is killed by treatments and will not sprout following top removal. Cutting blades remove aboveground herbaceous plant material at the level of the cutting blades. Some soil disturbance may occur due to cutting blades contacting the soils surface. Some mechanical damage can be done to herbaceous plants by passage of the tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Large amounts of woody and herbaceous plant litter is added to the soil surface. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
IV	Wyoming Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>) – Great Basin	Wyoming big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, and horsebrush are commonly found in association with Wyoming big sagebrush. These Wyoming big sagebrush plant communities are often found adjacent or intermixed with salt desert plant communities. Salt Desert plant species may be found at low to moderate levels in these big sagebrush plant communities at the drier end of its distribution. Annual plants commonly dominate disturbed areas. Introduced annual and perennial plants have made significant encroachments into these plant communities. Bareground, or a combination of bareground and microbiotic soil crusts is usually greater than 75% in these dry communities. Total shrub cover would be between 10-15%. Introduced annual and perennial plants have made significant encroachments into these plant communities.	Herbicide	<p>Herbicide is used to kill sagebrush in patches to reduce cover and density of sagebrush. Herbicide is applied a low rates where the objective is to thin the stand. Higher application rates will result in greater sagebrush kill. Post treatment plant community would have varying levels of dead and or dying sagebrush in the plant community. Associated herbaceous plants would increase density and cover in response to reduction in competition from sagebrush.</p> <p>Low Treatment Intensity – Low rates of the herbicide are applied resulting in isolated death of Wyoming big sagebrush plants. Chlorolysis of other plants that received lower levels of the herbicide will be common. Sagebrush skeletons will be left on plants killed by the herbicide. An increase in understory grasses and forbs will occur following sagebrush death. Associated shrubs will also increase leaf area and reproductive effort following death of sagebrush.</p> <p>Moderate Treatment Intensity – A greater number of dead sagebrush will occur in this due to the higher rates of herbicide application. Dead sagebrush may occur in patches. Increase in associated understory plants will be greatest in these patches of dead sagebrush. Leafless sagebrush skeletons will be obvious in the plant community.</p> <p>High Treatment Intensity – The greatest level of sagebrush death will occur in this treatment. Large patches of sagebrush skeletons will be obvious in the plant community. Individual sagebrush and small patches of live sagebrush will be scattered across the plant community. Associated woody and herbaceous plants will increase cover following death of sagebrush.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Basin Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>tridentata</i>)	<p>Basin big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, and horsebrush are commonly found in association with basin big sagebrush. Basin wild rye or similar larger perennial bunchgrasses are common. Rhizomatous grasses and forbs may be present in the understory of more mesic sites, forming a sod in portions of the understory. Bare ground, or a combination of bare ground and microbiotic soil crusts is usually greater than 50% in these communities. Much of this land has been converted to cropland and has reverted back to a combination of basin big sagebrush, rabbitbrush and perennial/annual plant communities.</p> <p>Basin big sagebrush has a large morphological amplitude. Plants may grow to over 6ft in height or be morphologically similar to Wyoming big sagebrush. Soil depth and effective moisture/climate appear to be the key factors. Deeper soils, with adequate available moisture, will produce large plants. Shallow soils on drier sites will produce shorter plants that resemble Wyoming big sagebrush. Shorter varieties of basin big sagebrush, and associated vegetation, probably respond similarly to Wyoming big sagebrush.</p>	Broadcast Burn	<p>Basin big sagebrush is readily killed by fire. However, associated shrub species, such as rabbitbrush sprout vigorously following top removal.</p> <p>Low Treatment Intensity – Plant communities with large basin big sagebrush plants may experience an condition similar to an under burn in forested systems. Tall sagebrush plants (> 3ft) may retain leaf canopy and experience charred stems near the soil surface. Shorter herbaceous and woody vegetation (< 3ft) will be burned by the fire. Fire has removed most of the leaves on the shrubs and the smaller branches of the shorter vegetation. Aboveground portions of forbs and grasses are consumed. Plants with heavier leaves may have portions left intact. Large perennial grasses have blackened crowns. Green plant material may or may not have been consumed, especially within dense grass crowns. Litter on the soil surface, most commonly found beneath shrub canopies, is scorched to partially consumed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>Moderate Treatment Intensity – Fire may remove some taller individuals as well as all leaves and branches of smaller shrubs. Aboveground portions of grasses and forbs are burned, but large plants may have recognizable parts blackened, but intact. Litter on soil surface, mostly beneath shrub canopies, is blackened and may be totally consumed in some areas. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p> <p>High Treatment Intensity – Fire has removed most of the aboveground portion of all shrubs grasses and forbs. Part of the shrub main stem may be present immediately following the fire. Most of the litter has been consumed by the fire and ash remain in the areas beneath shrubs. Crowns of grasses may be visible, but all live and dead plant material has been removed. Annuals may dominate immediate post-fire plant community. The magnitude of the post-fire annual flush will be dependent on the pre-burn annual composition. Areas with strong annual plant component prior to burning will have a strong flush of annual plants.</p>

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Basin Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>tridentata</i>)	<p>Basin big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, and horsebrush are commonly found in association with basin big sagebrush. Basin wild rye or similar larger perennial bunchgrasses are common. Rhizomatous grasses and forbs may be present in the understory of more mesic sites, forming a sod in portions of the understory. Bareground, or a combination of bareground and microbiotic soil crusts is usually greater than 50% in these communities. Much of this land has been converted to cropland and has reverted back to a combination of basin big sagebrush, rabbitbrush and perennial/annual plant communities.</p> <p>Basin big sagebrush has a large morphological amplitude. Plants may grow to over 6ft in height or be morphologically similar to Wyoming big sagebrush. Soil depth and effective moisture/climate appear to be the key factors. Deeper soils, with adequate available moisture, will produce large plants. Shallow soils on drier sites will produce shorter plants that resemble Wyoming big sagebrush. Shorter varieties of basin big sagebrush, and associated vegetation, probably respond similarly to Wyoming big sagebrush.</p>	Brushbeating / Mowing	More appropriate treatment for shorter varieties of basin wild rye. Response will be similar to Wyoming big sagebrush

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
III	Basin Big Sagebrush (<i>Artemisia tridentata</i> ssp. <i>tridentata</i>)	<p>Basin big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation is a mixture of perennial grasses and forbs. Green and gray rabbitbrush, and horsebrush are commonly found in association with basin big sagebrush. Basin wild rye or similar larger perennial bunchgrasses are common. Rhizomatous grasses and forbs may be present in the understory of more mesic sites, forming a sod in portions of the understory. Bareground, or a combination of bareground and microbiotic soil crusts is usually greater than 50% in these communities. Much of this land has been converted to cropland and has reverted back to a combination of basin big sagebrush, rabbitbrush and perennial/annual plant communities.</p> <p>Basin big sagebrush has a large morphological amplitude. Plants may grow to over 6ft in height or be morphologically similar to Wyoming big sagebrush. Soil depth and effective moisture/climate appear to be the key factors. Deeper soils, with adequate available moisture, will produce large plants. Shallow soils on drier sites will produce shorter plants that resemble Wyoming big sagebrush. Shorter varieties of basin big sagebrush, and associated vegetation, probably respond similarly to Wyoming big sagebrush.</p>	Herbicide	More appropriate treatment for shorter varieties of basin wild rye. Response will be similar to Wyoming big sagebrush.

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
II, III, IV	Sagebrush / cheatgrass (and other introduced annual plants) understory	Big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation varies from a mixture of perennial and annual grasses and forbs and to an understory dominated by introduced annual plants. The annual plant most commonly found is cheatgrass, however medusahead wild rye and other non- <i>Bromus</i> species are also a problem in certain areas. Perennial plants may be found beneath shrubs in stands dominated by annuals. Herbaceous plants form a continuous layer beneath the shrub canopy. Green and gray rabbitbrush, and horsebrush are commonly found in association with big sagebrush. Total shrub cover would fall between 15 – 25 %.	Broadcast Burn / Seed (drill)	<p>Burning treatments would kill big sagebrush. Most associated shrubs would sprout following top removal and become the dominant woody plant in the post-fire plant community. A follow-up seeding treatment would be required to reestablish a perennial plant dominated understory. Without seeding the plant community may revert to an annual dominated community.</p> <p>Low Treatment Intensity – Most sagebrush plants are killed by the fire. Leaves and small branches are consumed in the fire. Patches of unburned area exists throughout the treatment area. The fire removes the aboveground portions of herbaceous plants and partially consumes litter on the soil surface. Greatest amount of heat is experience and thus litter consumed occurs beneath shrub canopies. Seeding occurs in burned areas. Soil is disturbed to approximately 4". Standing sagebrush skeletons are broken down by passage of the tractor and drill.</p> <p>Moderate Treatment Intensity – Most sagebrush in plant community are killed by fire. Isolated main stem and branches of sagebrush are left standing following burning. Isolated of islands of unburned sagebrush can be found in areas where herbaceous vegetation is insufficient to carry the fire. The fire removes the aboveground portions of herbaceous plants and partially consumes litter on the soil surface. Greatest amount of heat is experience and thus litter consumed occurs beneath shrub canopies. Soil is disturbed to approximately 4". Perennial plants are seeded across treatment areas. Standing sagebrush skeletons are broken down by passage of the tractor and drill.</p> <p>High Treatment Intensity – All sagebrush are killed by burning and few to no standing shrub skeletons exist. Greatest amount of heat is experience and thus litter consumed occurs beneath shrub canopies. However, the fire consumes all litter on soil surface. Perennial plant seeding occurs across the treatment area. The soil is disturbed to approximately 4". Any standing shrub skeletons are broken down by the passage of the tractor and drill.</p>

ACTIVITY COMPONENT			WORK ELEMENT	
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
II, III, IV	Sagebrush / cheatgrass (and other introduced annual plants) understory	Big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation varies from a mixture of perennial and annual grasses and forbs and to an understory dominated by introduced annual plants. The annual plant most commonly found is cheatgrass, however medusahead wild rye and other non- <i>Bromus</i> species are also a problem in certain areas. Perennial plants may be found beneath shrubs is stands dominated by annuals. Herbaceous plants form a continuous layer beneath the shrub canopy. Green and gray rabbitbrush, and horsebrush are commonly found in association with big sagebrush. Total shrub cover would fall between 15 – 25 %.	Broadcast Burn / Seed (aerial)	Conditions would be similar to above broadcast burning/seeding (drilling) however there would be little to no surface soil disturbance attributed to tractor and drill. Success of seeding will be more variable than if a drill was used.

ACTIVITY COMPONENT		WORK ELEMENT		
Fire Regime	Existing Vegetation Type	Pre-Treatment Vegetation Description	Treatment Type	Post-Treatment Vegetation Description
II, III, IV	Sagebrush / cheatgrass (and other introduced annual plants) understory	Big sagebrush dominates the plant community and is the most obvious woody plant. Herbaceous understory vegetation varies from a mixture of perennial and annual grasses and forbs and to an understory dominated by introduced annual plants. The annual plant most commonly found may be cheatgrass, however medusahead wild rye and other non- <i>Bromus</i> species are also a problem in certain areas. Perennial plants may be found beneath shrubs in stands dominated by annuals. Annual plants are scattered across the interspace areas. Bare ground may account for over 75% of the total cover. Green and gray rabbitbrush, and horsebrush are commonly found in association with big sagebrush. Total shrub cover would fall between 20 – >30 %.	Brushbeating / Mowing / Seeding (drilling)	<p>Brushbeating results in the severing/shredding of the upper portions of the shrubs. Big sagebrush does not sprout following removal of the aerial portions of the plant. However, associated shrubs sprout to varying degrees. Low growing herbaceous and woody plants can be missed by cutting blades. Treatment is often done in late fall when fire danger is low and the majority of plants are dormant. Brushbeating can also be done in winter or early spring if weather permits.</p> <p>Low Treatment Intensity – Brushbeating occurs across less than 25% of the plant community. Cutting equipment is held at 18" above the soil surface. Only tops of larger shrubs are removed by cutters. Lower branches of larger shrubs and smaller shrubs are left intact. Minimal disturbance occurs to herbaceous plants. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter is increased in interspace areas by cutting. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community. Tractor and drill disturb the soil to approximately 4". Shredded plant material is incorporated into the soil by drilling.</p> <p>Moderate Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held at 12-18" above the soil surface. The majority of larger shrubs have the tops removed. Sprouting of may be stimulated in shrubs other than mountain big sagebrush. Woody plants less than 12" tall are not damaged by the cutting blades. Most herbaceous plants are dormant during the treatment. Only aerial portions of herbaceous plants are removed by cutters, minimally impacting these plants. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Plant litter increases following treatment. Moderate amounts of woody litter are added to the soil surface. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community. Tractor and drill disturb the soil to approximately 4". Shredded plant material is incorporated into the soil by drilling.</p> <p>High Treatment Intensity – Brushbeating occurs across 25-50% of the plant community. Cutting equipment is held below 12" above the soil surface. Most shrubs have tops removed leaving a plant community. Sprouting shrubs will begin to send up shoots in the next growing season. Sagebrush is killed by treatments and will not sprout following top removal. Cutting blades remove above-ground herbaceous plant material at the level of the cutting blades. Some soil disturbance may occur due to cutting blades contacting the soils surface. Some mechanical damage can be done by passage of tractor. Soils are usually dry and/or frozen during this treatment, reducing compaction. Large amounts of woody and herbaceous plant litter is added to the soil surface. Annual plant density and cover will initially increase following treatment. The magnitude of the increase is directly proportional to the level of annual plants in the pre-treatment plant community. Tractor and drill disturb the soil to approximately 4". Shredded plant material is incorporated into the soil by drilling.</p>

ACTIVITY TYPE: Range Infrastructure

Fire prevention actions and post fire activities in rangelands may require rehabilitation of native ranges and construction, repair or replacement of range improvement structures. Fences and water developments are common structures used for livestock management and/or protection of rangeland resources. The construction, reconstruction, and maintenance of fences and water developments and rangeland restoration activities may require the use and hauling of heavy equipment, and the hauling and storage of materials.

Related Work Elements may be found in: **Weeds and Chemical Treatments Activity Type** regarding weeds; **Prescribed Fire Activity Type** regarding fire and camping; and **Access and Equipment Maintenance Activity Type** regarding access, fueling and transportation.

ACTIVITY COMPONENTS WORK ELEMENTS

Fence Construction / Reconstruction / Maintenance

These activities normally require material transport, ground disturbance, and the use of power tools or large equipment. Materials for wooden fences may be gathered and prepared on or near the construction site. This work generally is accomplished with power tools. Standing trees may be used where available and incorporated into the fence design for strength and cost savings.

Stringing Wire - Wire is strung and attached to fence posts with clips. ATV's and pickups trucks are commonly used to string wire.

Digging Post Holes – manual / mechanical - Posts may be set at times using a tractor with an auger or pounder and tractors. Posts are wooden or metal. Fence repair or reconstruction may require any or all of the above types of work related to fence construction

Clearing Right of Way –This is accomplished in timber or brush with minimum clearing widths commonly four to five feet on either side of fence. Clearing methods are comprised of hand tools, or with mechanized equipment such as chain saws, brush hogs, road graders and bulldozers. Hazard tree removal may be necessary to protect fencing and work sites.

Building Rock Jacks – Rock jacks and rock cribs are used to anchor a fence. Both are built with rock, wood, or metal posts. Rock drills may be used to create anchor points where solid rock is available.

Onsite Material Cutting, Gathering Rocks, etc – Cutting trees for fence posts will generally require the use of chainsaws, or hand saws depending on the need. Rocks are gathered at the site or hauled in when they are not available to build rock jacks and cribs.

Pre-project Weed Control – GO TO **Weeds and Chemical Treatments Activity Type** for Work Elements describing this activity.

Spike/Work Camps – GO TO **Prescribed Fire Activity Type, Fire Support Activity Component, *Fire/Spike Camp* Work Element** for the description of this Work Element.

Rangeland Restoration

Restoration of native vegetation and natural site conditions may be needed following both wild and prescribed fires, particularly in previously degraded sites or where invasive species are likely to establish. Restoration activities are generally designed to facilitate immediate or eventual re-establishment of native vegetation (grasses, forbs and shrubs), and site conditions that will promote native vegetation establishment).

Depending on disturbance level, seeding may be necessary. If seeding is necessary, seeding activities should use native seeds or non-native sterile annuals (e.g., Regreen, native hybrids) to provide ground cover for the first year following ground disturbing activities. These species will not out-compete native vegetation that would re-establish on the site naturally. The establishment of certain native species that are less susceptible to fire is necessary to restore the natural function of native vegetative communities. An example would be cheat grass infested sites that tend to burn every few years, not allowing native species to get established, which are less susceptible to frequent fires and allow shrubs to establish

Preparing the seedbed for seeds and/or seedlings is a necessary step in most cases. Mechanical methods such as chaining, rangeland plowing, and disking are commonly used to prepare a seedbed for planting by roughening soil surfaces, damaging or killing existing unwanted vegetation, and facilitating the planting process. Roughening the soil surface loosens soils, reduces soil crusts, allows for water retention, and reduces wind speed and temperature extremes. These conditions are desirable for successful seed germination and plant survival.

Seeding - aerial - Aerial application by fixed wing or helicopter is used to seed vast areas or to facilitate the success in establishment of a specific species.

Seeding – disking, drilling, fertilizing, plowing

- **Disking** - Disks are attached to tractors and are generally used to temporarily break surface crusts and kill shallow rooted plants (weeds). These are typically used on sites with lower shrub densities dominated by grasses and forbs.
- **Drilling** – Rangeland drills are used to plant seeds when uniform seed distribution and proper seed depth are required for plant establishment. Rangeland drills are attached to back of a tractor and requires a firm seedbed and uniform terrain without obstructions to operate effectively.
- **Fertilization** – Fertilizer may be used to enhance the seedling germination and increase seedling survival. Fertilizer can increase the potential of noxious weed establishment if a seed source is present. Fertilizers can be broadcasted or aerially applied.
- **Rangeland Plows** - Plows attached to tractors are used to improve crusted or compacted soil, at least temporarily, and kill or damage competing vegetation. These are used on sites where grasses dominate.

Chaining - Chaining is used to remove and or destroy vegetation. Chain-dikers have disks welded to the links of an anchor chain. This is pulled behind a crawler tractor and as the chain rotates it improves tillage, land smoothing and basin formation, in a single pass. This is the most effective method for preparing seedbeds on sites with relatively large amounts brush and other woody debris.

Prescribed Fire – GO TO **Prescribed Fire Activity Type** for the description of work elements associated with this activity.

Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells)

Several types of water developments may be needed to implement livestock allotment plans, or enhance and protect an area's other resource values.

Rock Haul/Material Haul - Transporting materials to the site can be done by human-power, pack animals, all-terrain-vehicles, pickup truck, or helicopter. Material transport may create disturbance along transport routes and at the site. Disturbance potential is dependent on the time of year, duration, frequency, and habitat through which the transport occurs.

Earthwork - Cat, Dragline, Scraper – Ponds and/or dams are always constructed with heavy equipment (e.g., dozers, backhoes or scrapers). Material for dam construction is usually excavated from the catchment area, and heavy equipment repeatedly hauls material to heighten the dam. Likewise, for dam maintenance, silt must be excavated from the catchment area, sometimes using a dragline to pull material from the catchment area. Sometimes material must be hauled in for dam construction or for a water holding basin.

Pipelines - Trenching - Pipelines are used to transport water from a water source (i.e. creek, developed spring, or well) to another location. Pipeline construction includes transporting materials, trenching (usually with a backhoe or trencher), and installing troughs.

All Water Developments – Clearing - Clearing an area for the installation of a water development may be accomplished by any number of methods, manual or mechanical. Vegetation may be cleared with a dozer, weed-whacker, brushbuster, rake, hoe, or chainsaw. See **Reforestation, Mechanical Treatments, or Weeds and Chemical Treatments Activity Types** for additional information and descriptions regarding this Work Element.

All Water Developments – Transporting Materials – Material transport for water developments may be by truck or helicopter. Repair, construction or reconstruction of any water holding device (be it natural or artificial), requires transport of materials by person, on and/or off-road vehicles, helicopter, or by pack animal. Transport may occur off designated roads or trails, at times requiring lengthy cross-country travel. Generally, transportation of large water catchments with high storage capabilities utilized for livestock guzzlers is not practical.

All Water Developments – Installing Troughs, Storage Tanks, or Pits - Spring development generally requires excavation of the water source by hand, or with heavy equipment (e.g.,

backhoes or trenchers) to install a head box or perforated pipe. Normally trenching buries pipe from the head box to the trough and from the trough to the overflow pipe. A *trough or troughs* are installed and the water source is fenced to exclude livestock. *Guzzlers or trick tanks* are water storage containers catch and store water for wildlife and livestock use and generally are built where no natural water sources such as streams, springs or ponds exist. They may also be built to draw livestock away from natural water sources or decrease their use.

Storage containers, made of fiberglass, metal, or a bladder-lined pit, can hold up to 10,000 gallons for livestock use. Storage containers for wildlife guzzlers are much smaller (1,000 gallons) and containing two or three polyurethane or metal tanks per site. Containers are plumbed to aprons and then water is piped to a trough or troughs where livestock drink. Typically, areas around catchments are fenced to exclude livestock. Smaller storage tanks used for wildlife guzzlers often require *earthwork* for burial and a small dozer typically is used for removal and backfill of soil. These tanks may be repeatedly checked four or more times a year to ensure proper functioning.

All Water Developments - Installing/Building Fence Around Development – GO TO **Fence Construction/Reconstruction/Maintenance Activity Component**, contained within this Activity Type, for the description of this Work Element.

All Water Developments - Constructing Apron - Rubber, Metal, Asphalt - Guzzler catchments (often called aprons), catch and store precipitation and generally are made of rubber, sheet metal or asphalt; varying in size depending on size of the storage container.

ACTIVITY TYPE: Recreation Facilities and Operations

This activity includes obliteration, rehabilitation, reconstruction, and new construction of recreation facilities. Work elements will vary widely in response to the effects a recreation site may receive from fire or suppression activities. The acquisition of materials (e.g., gravel, riprap, boulders, borrow) for construction or reconstruction may occur on lands not adjacent to the recreation facility, and impacts may be associated with operations at these material sources. Activities associated with recreation facilities and operations may be needed where fire may have caused damage, during suppression activities, or for the development of defensible space) around the facility. Related Work Elements may be found in: **Access and Equipment Maintenance Activity Type** regarding access and fueling; **Defensible Space Activity Type**; and **Range Infrastructure Activity Type** regarding water development.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Existing Facilities Developed and Dispersed

Install Site Furniture – Installing site furniture such as tables and grills requires some ground disturbance, vegetation removal, and excavation for sinking table legs, fire rings, or pedestal grill supports. Ground hardening around site furniture can be done with gravel, asphalt, or concrete.

Remove Trees and Ground Vegetation, Blade to Create Smooth Surface, Apply gravel, Asphalt or Concrete to Harden Surface – Removing trees, shrubs and other site vegetation may be accomplished with a variety of methods. See the **Mechanical Treatments and Reforestation Activity Types** for additional information associated with these activities. Blading and smoothing the surface (or adding topsoil) would occur before applying gravel, asphalt, or concrete. Materials would be hauled to the site and applied by the use of heavy equipment and hand tools.

Install/Remove Toilets

Toilet installation may require clearing trees and other vegetation, excavation for vaults, backfill around vaults, and transport and installation of buildings. Large cranes may be necessary for building placement. The ground around the structure may need to be re-contoured, and topsoil added to prepare the area for seeding or planting.

Harden Entry to Building – Areas in front of buildings are typically hardened with gravel, asphalt, or concrete to withstand expected wear.

Remove Trees, Excavate, Construct Building – Removing trees, shrubs and other site vegetation may be accomplished by variety of methods. Tools such as chainsaws, weed whackers, or other power tools and equipment may be used. Slash would be piled for subsequent removal. See the **Mechanical Treatments and Reforestation Activity Types** for additional information associated with these activities. Excavation of an area would be required to place the foundation and vault. This can be done with a small backhoe and/or other digging device. The building may be hauled to or constructed at the site.

Collapse Building into Vaults or Haul Structures Off-Site – Components such as toilet vaults and foundations are sometimes capped and buried at the site. The site is then rehabilitated. The old structure may also be properly contained, and hauled away from the site for disposal. These activities require the use of heavy machinery, and vehicles for hauling such as dump trucks or trucks with trailers.

Installation of Other Site Amenities

Other site amenities such as interpretive signs, garbage containers, water developments, or other structures may be installed. As with installing a toilet, some of this work will require excavation, clearing vegetation, and rehabilitation of the area with grading and leveling for the application of gravel, asphalt, or concrete. Installation of culverts, ditches, and other types of drainage devices may also be required.

Remove Trees and Vegetation, Excavate, Backfill - These activities generally require the use of power tools and other mechanized machinery, depending on the location and magnitude of the job. Vegetation clearing can be done with hand tools, small dozers, backhoes, brush whackers, or other tools appropriate for the work.

Obliteration/Rehabilitation of Recreation Sites

Obliteration or rehabilitation may be needed for developed or dispersed sites, and this may affect an entire recreation facility (campground, picnic area or trailhead), or simply occur within a portion of the developed site. Rehabilitation is common where resource concerns warrant action such as moving campsites away from river banks/riparian areas. Hardening roads and/or spurs may help reduce sedimentation.

Related Work Elements may be found in **Roads and Roads Maintenance Activity Type** regarding activities associated with hardening roads. Regarding rehabilitation, related Work Elements may be found in **Watershed Restoration Activity Type, Reforestation Activity Type, and Range Infrastructure, Rangeland Restoration Activity Component**.

Remove any Existing Site Furniture – Rehabilitation may be complete or partial, and include permanent removal of damaged or old site components, or replacement with new amenities. Removal of facility components such as toilet buildings, tables, grills, fire rings, fire hydrants, and signs may be necessary.

Install Barriers (Boulders, Fencing, Signs, etc. – GO TO **Range Infrastructure Activity Type, Fence Construction/Reconstruction/Maintenance Activity Component** for the description of fencing only. All other activities covered by this Work Element are described as follows. Ground disturbance needed for post installation depends on the type of fence (free-standing verses post/pole). Other than where posts are placed, ground vegetation can remain in tact. Tree removal can usually be avoided. However, in places of extremely dense forest, individual tree removal may be necessary. Boulders may be placed as barriers and are usually attained from public lands, close to the facility. Heavy equipment is necessary for digging up native boulders, transporting, and placing them in the developed site. Placement includes digging a hole (typically 1-2 feet deep) and placing the boulder in it. Backfill may be necessary.

Rip Surface, Re-contour, Topsoil, Seed, Mulch - GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component** for the description of seeding. GO TO **Reforestation Activity Type, Hand plant riparian/upland** for the description of tree or shrub planning. Other activities covered by this Work Element are described as follows. These activities may be implemented on roads and/or spurs, trailheads, parking areas and other compacted areas. Some sites may need surface ripping, re-contouring or scarification for seedbed preparation. Native seeds or seedlings, or an annual fast rooting species, may be used to stabilize the site until native vegetation re-establishes. Where seeds are slow to establish and native forbs and grasses have long-lived roots systems, the introduction of root-rich soil from the local area helps re-establishing ground cover. In some areas, topsoil may be hauled to the site and spread before seeding. See **Watershed Restoration Activity Type** for additional information related to this Work Element. Mulch application helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling.

Recreation Site Maintenance

Road Grading, Spot Graveling - This may occur in both dispersed and developed sites and on roads and road spurs. GO TO **Roads and Roads Maintenance Activity Type, Road Maintenance Activity Component, *Blading and grading* Work Element** and *Surface rocking (rock replacement) Work Element* for the description of this Work Element.

Water Development

Related Work Elements may be found in **Range Infrastructure Activity Type, Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells) Activity Component**.

Excavate Hole, Pump Installation – Installing a water structure may require the development of a well. The well is generally capped with a hand pump and concrete pad (typically 5 foot radius); distribution lines are then placed to various locations within the developed site.

Trenching for Distribution Line – Distribution lines are placed in trenches approximately 30 inches to six feet deep; disturbance widths will vary from two to three feet. The trench is filled with gravel (or loose rock), pipe is placed, and the trench is backfilled. The surface is then leveled, top soil added and seeded. Trenching typically requires the use of hand and power tools as well as heavy equipment. See **Range Infrastructure Activity Type, Water Development Construction/Reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells) Activity Component, Pipelines – trenching Work Element** for more information on this activity.

Additional Information on Recreational Facilities

Dispersed camping and boating sites are typically accessed from two-track or narrow graveled roads. Dispersed camping sites are typically undeveloped (i.e., absence of tables, restrooms, or grills) and user-constructed rock fire circles are often present. Sites typically have native surfacing with sparse vegetation and compacted soils from concentrated use. Many dispersed sites occur near water, often within riparian zones found around lakes and along streams and rivers. Boating sites (where users launch and remove boats) commonly have user-defined pedestrian trails and user-developed motorized trails that extend directly to the water's edge.

Developed campgrounds have defined interior roads and camping spurs, typically surfaced with gravel or asphalt. Each site generally includes a table and fire ring, a pedestal grill, hydrant, and electrical hook-up. Within developed campgrounds, toilet buildings, signage, fee stations, garbage receptacles, and additional water hydrants are present.

Trailheads have defined parking areas (usually surfaced with gravel or asphalt), informational signing and/or kiosks, corrals, hitch rails, toilet buildings, potable water, water trough, and a horse unloading ramp.

Picnic Sites generally have parking areas (usually surfaced with gravel or asphalt), picnic tables, and toilet buildings. Sites are managed for day use only and may have interpretive signs, linkages to day-use trails, garbage receptacles, fire rings, pedestal grills, and play areas.

ACTIVITY TYPE: Reforestation

Reforestation activity components primarily address treatments needed to replant and seed forested habitats. Several of these activity components include activities that overlap with other activity types. Identified overlaps direct the user to location of additional pertinent information.

Related Work Elements may be found in the following Activity Types: **Access and Equipment Maintenance** regarding access and fueling; **Range Infrastructure** regarding fencing; **Prescribed Fire** regarding site preparation, fire and fuels reduction, and camping; **Roads and Roads Maintenance** regarding road work; and **Weeds And Chemical Treatments** regarding weed control.

ACTIVITY COMPONENT AND WORK ELEMENTS

Access for Reforestation Activities

Opening Closed Roads Including Snowplowing - Access for reforestation activities (e.g., tree planting, surveys, animal protection) may result in repeat visits after initial planting. Although motorized vehicle access (i.e. truck) is preferred, when vehicle travel is restricted or in unroaded areas, the transport of trees, equipment, and crews may be done with ATV's, foot, pack animal or helicopters, depending on the travel plan regulations.

Snow plowing is commonly required to access spring planting units. Although snow caches are not common, when they are used snow plowing to the cache area is required as early as January. Commonly, drifts are plowed and the road is allowed to dry before the crews access the units for planting. In very high snow areas, the majority of the snow is plowed leaving several inches to melt and the road to dry before vehicle use. Road maintenance practices to minimize sediment transport should be used.

See **Access and Equipment Maintenance Activity Type, Access to work site Activity Component**, and **Roads and Roads Maintenance Activity Type, Road Maintenance Activity Component**, *Opening closed roads, including logging out, snow plowing Work Element* for additional information.

Animal Damage Control

Chemicals, traps, netting and fencing may all be used to protect planted seedlings from animals.

See the **Range Infrastructure Activity Type, Fence Construction/Reconstruction/Maintenance Activity Component** for fence construction and reconstruction work elements.

Chemical Application Above and Below Ground - Direct gopher control includes baiting with rodenticides (generally strychnine treated grains); and elk and deer damage control includes the application of animal repellants such as Big Game Repellent (putrescent egg solids chemical) or similar commercially available chemicals to seedlings.

Netting and Associated Device for Protection - Seedlings can be protected from some damage by slipping vexar tubing or netting over the seedling. In addition, fencing is used to protect plantations from cattle although altered pasture systems are generally as effective and less costly. Fencing plantations to protect trees from big game is generally done only on high value plantations such as aspen clones. See the **Range Infrastructure Activity Type, Fence Construction/Reconstruction/Maintenance Activity Component** for fence construction and reconstruction work elements.

Use of Snap Traps for Animal Removal – These traps kill the target species and may be placed in gopher runs or other areas where small rodents are threatening regeneration areas.

Artificial Shade

Where there is inadequate natural shade provided by stumps, logs and other structures, artificial materials are used to protect planted seedlings from mid-day sun or high solarization.

Shade Cards - For protection, artificial shade materials, such as styrene cards or mesh shade cloth, can be secured next to the seedlings with wire pins.

Aspen Regeneration/Protection Fencing

GO TO **Range Infrastructure Activity Type, Fence Construction/Reconstruction/Maintenance Activity Component** for the description of fencing. GO TO **Threatened, Endangered Species Habitat Restoration, Aspen Restoration Activity Component** for a description of aspen restoration activities. Related Work Elements may be found in the **Reforestation Activity Type**.

Camping

Tree planting crews may camp near planting sites to reduce travel time. Site selection and maintenance of the camp (trash, clean-up, waste water) is controlled with the planting contract. Crews are generally not allowed in improved campgrounds or areas commonly used by the public. GO TO **Prescribed Fire Activity Type, Fire Support Activity Component, Fire/spike camp Work Element** for the description of this Work Element.

Collection of Plant Propagation Materials

Climb to Access or Mechanically Pick Cones - Cone collection requires access to the upper 1/3 of the tree crown when the cones are ripe. Cones may be collected by mechanical means, or by climbing a tree to reach the tree crown. Climbing trees does not cause damage, although spurs should not be used on some species (western white pine). In level terrain, such as seed orchards, cherry pickers and other machines can be used to access the cones directly in the tree crown. Collection for most species begins in August although testing for cone ripeness occurs earlier in the season.

Firearm Use - Branches may be shot off with guns when small amounts of material are needed.

Pollen, Scion Material - Material necessary for genetic work is collected as described for cone collection. Scions are tree branches brought to nurseries for sprouting or grafting to other trees. Cages are sometimes placed over cones attached to trees to protect them from damage or consumption by various wildlife species. For example, white bark pinecones are caged in some areas for protection from Clark's Nutcrackers.

Collection of Seeds or other Vegetation Material – Seeds and other vegetative material are collected for propagation from their native setting. Most collection occurs by hand.

Tree Felling to Access Cones - Occasionally, trees are felled and cones are picked directly from the crowns. These trees cannot be used for future cone collections and they may be sold in a small sale or left on the ground as large woody debris. This may be done in timber sale units prior to harvest operations. GO TO **Mechanical Treatments Activity Type, Tree Felling Activity Component** for the description of this Work Element.

Fuels Reduction

Burning Slashed Material, including Broadcast Burning – GO TO **Prescribed Fire Activity Type** for the description of Work Elements associated with this activity.

Hand Plant Upland/Riparian

Plant Trees and Shrubs with Hoe, Bar, Auger - Tree planting occurs primarily in spring, with some summer and fall planting. Non-conifer trees and shrubs may be planted in conjunction with traditional conifer planting operations, or as a separate activity. Competing vegetation may be removed as part of the planting operation (refer to following Activity Component – “Site Preparation”). A hole is opened and a single seedling planted. Planting units may be concentrated in small geographic areas for logistical purposes. Crews range in size from 4 to 30 people depending on the size of the planting program. Hoe dads, augers, bars, and shovels are used to plant trees. The auger is the only mechanized tool.

See the **Access and Equipment Maintenance Activity Type** for related work elements.

Natural Regeneration Surveys

Generally, on timber suitable lands or previously harvested lands, surveys are conducted within one year of harvest or wildfire, and subsequently at years three and five. Survey intensity is dependent on the agency's land management objectives. On unmanaged lands, an initial post fire assessment should be conducted to determine regeneration potential. Many forested areas naturally regenerate and periodic monitoring occurs to assure regeneration.

See the **Access and Equipment Maintenance Activity Type, Access to Work Site Activity Component** for related work elements.

On-Site Tree Storage

In the absence of a cooler, tree storage may be necessary at or near the planting site to prevent trees from breaking dormancy before planting. Road plowing may be necessary to access the site where the cache will be constructed and maintained. See access for reforestation activities (above) for additional information.

Building and Maintaining Snow Cache - Although not a common practice, caches may be placed in isolated higher elevation areas to store seedlings for spring planting. Caches are built as early as January by pushing snow over a simple frame by a small bulldozer (D6) and allowed to freeze in place. Structures may be covered with straw or sawdust to maintain snow. Boxes of tree seedlings are stored in the cache until needed for out planting. Access roads must be snowplowed for cache construction and maintenance.

Pre-Activity Surveys

GO TO **Access and Equipment Maintenance Activity Type, Access to Work Site Activity Component** for the description of Work Elements associated with this activity.

Return Visits after Planting

Return visits are typically conducted to inventory, monitor and conduct maintenance activities in areas planted or naturally regenerating. Netting and shade cards are maintained at least annually. Maintenance generally involves walking through the unit straightening or replacing shade cards knocked down or destroyed by animals, and/or re-installing netting and putting in new nets.

After tree planting, surveys are conducted after the first and third growing seasons, and sometimes during the fifth year as described for natural regeneration surveys. The entire acreage planted will be surveyed.

Related Work Elements may be found in **Access and Equipment Maintenance Activity Type, Access to Work Site Activity Component**.

Seed Production Development

Forested areas, from 5- 30 acres, are selected as seed tree production areas and are located where trees are phenotypically superior, and where cones and seeds will be collected over long time periods (10 + years).

Commercial Thin to Remove Undesirable Trees, Cone Crop Enhancement - To enhance the genetic quality of seed collected from certain stands, areas are typically commercially thinned and the material sold in commercial timber sales. GO TO **Mechanical Treatments Activity Type, Harvest Prescription/Implementation Activity Component**, *Understory / Single Story Treatments: Thinning Work Element*, for the description thinning. To enhance pollen and cone crop production, fertilizers are applied semi-annually. GO TO **Insect and Disease Suppression Activity Type, Fertilization Activity Component**, *Hand application of N frells* for hand fertilization. GO TO **Weeds and Chemical Treatments Activity Type, Cultural Control Activity Component**, *Fertilize by hand, machine or aerial Work Element* for other fertilization applications.

Treat Slash Mechanically or by Hand – After commercial thinning treatments, excess slash may be hand or dozer piled. Piles may be left, removed or burned. GO TO **Mechanical Treatments Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component**, for the description of this Work Element.

Site Preparation

Prior to planting or natural regeneration, site preparation is conducted to reduce fuels and competing vegetation, and further ensure seedling establishment and survival.

Related activity components and work elements that describe activities needed to prepare a site for planting using fire can be found in the **Prescribed Fire Activity Type**. Fire removes the woody debris and herbaceous litter that interferes with seedbed preparation. The effectiveness of using fire to remove debris varies with environmental conditions and the amount and distribution of fuel.

In some cases, mechanical site preparation is done in conjunction with a timber sale or a separate activity. See the **Mechanical Treatments Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component** for related information.

Mechanical Scarification - Mechanical methods of site preparation include the use of a small bulldozer such as a D3 with a brush rake, salmon blade, or similar tool to remove plants, roots, and rip topsoil and sod, exposing mineral soil. Some machines are designed to scarify patches (breaking up the organic mat on the ground layer so seeds can easily send roots into the mineral soil below), while other machines do more intensive soil disturbance. See **Mechanical Treatment Activity Type, Rehabilitation, Removal of Excess Vegetation and Slash Activity Component** for additional information.

Chaining is another mechanical treatment used to remove and/or destroy vegetation in areas with dense shrubs or small trees. For this procedure, a heavy chain is extended between two tractors; brush and other small trees are destroyed or pulled up as the tractors proceed through a treatment area. Chain-dikers have disks welded to the links of an anchor chain. This is pulled behind a crawler tractor and as the chain rotates it improves tillage, land smoothing and basin formation, in a single pass. This is the most effective method for preparing seedbeds on sites with relatively large amounts brush and other woody debris.

Hand Scalp/Grubbing – Alternatives to machine scarification include hand scalping (grubbing) during tree planting operations. A hand scalper is used to prepare spots for planting. When sod is not heavy, vegetation may be scraped and removed from an area with a radius of up to 12 inches. Grubbing is done using a heavy hoe (a grubbing hoe), to remove plant roots.

Hand Mechanized Scarifier – This is a brush blade with a head on it that rips the topsoil and sod at each planting area. See **Mechanical Treatments Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component** for additional applicable Work Elements.

Spot Application of Herbicides - Spot applications of herbicides such as Pronone (hexazinone) or Roundup (glyphosate) may also be used. GO TO **Weeds and Chemical Treatments Activity Type, Herbicide Control Activity Component**, for the description of Work Elements used to apply herbicides.

ACTIVITY TYPE: Roads and Roads Maintenance

Roads are constructed and operated to provide access and mobility. Road construction, re-construction, operations, and maintenance consist of standardized practices that include many different activity components and work elements. Where appropriate, agency and commercial users are required to remove mud and other debris from vehicles and other equipment. This helps to reduce the likelihood of transporting noxious weeds, non-native plants, and plant diseases to a site. Related Work Elements may be found in **Access and Equipment Maintenance Activity Type** regarding access and fueling.

ADDITIONAL ROAD NARRATIVE INFORMATION

Road Maintenance Levels

Level 1 – Level 1 roads are physically closed for long periods and may be opened only for selected activities. These roads are probably not surfaced other than with native materials. When these roads are open, only vehicles with high clearance may be used on these roads, and passenger cars are not given consideration.

Level 2 – Level 2 roads are usually open, but may be seasonally closed. These roads are probably not surfaced other than with native materials. These roads are maintained for high clearance vehicles. Passenger cars are permitted, however, these roads are not maintained for such. These roads receive minor average daily traffic (ADT).

Level 3 - Level 3 roads are opened and maintained for the prudent driving of passenger cars. These roads meet Highway Safety Act standards. These roads are single land roads with turnouts and are used at typically low speeds. Road user comfort and convenience is not given priority. The surface of these of roads may be composed of native or aggregate material.

Level 4 – Level 4 roads are opened, maintained and provide a moderate degree of user comfort and convenience. These roads are traveled at moderate speeds and they meet Highway Safety Act standards. The majority of these roads are double lane, although, some may be single lane with turnouts. The surface of these of roads is composed of aggregate material or pavement.

Level 5 - Level 5 roads are open, maintained, and provide a high degree of user comfort and convenience. These roads meet Highway Safety Act standards, are normally paved and have double lanes. Some of these roads may have aggregate and dust abated.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Decommissioning Roads

Decommissioning roads will involve different combinations of activities, such as closing open roads and road obliteration. Roads chosen for decommissioning are those no longer needed for transportation purposes. Such roads may be in poor locations or causing unacceptable sediment loads or disturbance to wildlife or plants. Decommissioning may require the construction of *earth berms*, or work elements such as *re-vegetation*, *roadbed ripping*, *side cast pullback*, *re-contouring*, *erosion control*, *water barring*, and *culvert removal*. These work elements may require use of bulldozers or other heavy machinery. The most important activity associated with road decommissioning is the restoration of hydrological function.

Re-vegetation – GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component**, for a description of Work Elements related to seeding. GO TO **Reforestation Activity Type, Hand plant upland/riparian Activity Component, Plant trees and shrubs with hoe, bar, auger Work Element** for a description of planting trees and shrubs. Other activities covered by this Work Element are described as follows. Re-vegetating areas for road decommissioning, or for areas left bare after construction, reconstruction and/or restoration is important for re-establishing soil and slope stability. Re-vegetating activities may be accomplished by mechanical or manual means. Seeding, mulching seedling planting, and fertilizing are common practices. Seed mixes, seedlings, vegetation mats, and sediment filters may all be used during re-vegetation. In most cases, native species are used to re-vegetate and stabilize exposed slopes to the extent possible. Invasive species are not used in seed mixes. Native seed mixes may be spread over the disturbed area or the area may be replanted with saved native or nursery stock plants.

Re-contouring – Decommissioning may involve re-contouring the road surface to approximate the pre-road condition. Obliteration involves placing sidecast material back onto the road surface using a large backhoe. Full re-contouring means the replacement of sidecast or replacement materials back onto the roadcut to restore the original slope angle. Re-contouring

normally requires the use of heavy equipment such as excavators. Re-vegetation measures are implemented as appropriate for the site.

Water Barring – Water barring is accomplished by using a bulldozer or excavator to dig a trench across the road surface. Water bars forcibly interrupt water flow to prevent erosion and decrease sediment distribution. They are generally placed at a 30 - 40 degree angle to the road surface, and more are installed where road grades increase.

Roadbed Ripping - Roadbed ripping can be accomplished with a bulldozer pulling a bar with teeth, or by using an excavator to scarify the roadbed with a toothed bucket. Ripping helps restore water infiltration and facilitates vegetative growth.

Culvert Removal – In most cases, culverts and their associated fills are completely removed to return the stream channel to its original width and function. Culvert removal requires the use of mechanical equipment. Small culverts can be removed with rubber-tired backhoes but large culverts may require the use of larger backhoes with metal tracks. Culverts are removed from the site for salvage or disposal. Culvert removal can temporarily increase sediment loads. Appropriate re-vegetation and temporary erosion control measures are generally needed at culvert removal sites.

Berm/barrier construction – A berm is a barricade placed to restrict road access and is generally composed of natural material such as a soil berm, combination of soil berm and ditch, logs, rocks, or vegetation. Excess soil from side cast, or excavated from the road template, creating a berm in combination with a ditch, may be available for its construction. Berm construction is generally done with a small bulldozer, excavator, or backhoe, if needed a dump truck may be used to haul material to the site. Other items such as boulders, logs, root wads, gates, guard rail barriers, or other constructed barriers are used to restrict access. Construction may require excavation, digging post-holes, clearing vegetation, and rehabilitation of the area with re-vegetation.

Side Cast Pullback – This is an operation accomplished by using an excavator to pull the material away from a fill slope. The material is then piled against a slope or loaded into a dump truck for removal to a waste area. This activity is implemented during road decommissioning.

Road Maintenance

Road maintenance is needed to protect water quality and aquatic resources, to meet access needs and to provide safe and efficient road operations. Road maintenance consists of a variety of activity components and work elements and these will vary by objective and concerns for other resource. Work elements include surface rock replacement including small quantities of spot surfacing, roadside brushing, erosion control, logging out, road surface blading, ditch cleanout, slide removal, dust abatement, and other items that contribute to the preservation of the existing road.

Traffic control – Controlling traffic use and patterns may require the use of permanent signs, special event signs, temporary signs, and/or use of flaggers, special closures, or closures for

specific uses. Traffic control can use portions of traffic management such as discouragement techniques to control the volume of use, type of use, or type of vehicle. Signing is needed for special conditions such as log hauling or fire management situations. Road signs may be directional, issue warnings, designate speeds or used for a number of other purposes. Ongoing sign management requires maintenance, installation, removal, and/or repair.

Blading and grading - Blading restores the shape of the road and redistributes aggregate evenly on the roadbed. Blading eliminates potholes, tire wear ruts, and other features that tend to concentrate water and accelerate erosion. This activity helps to make the surface of the roadbed more even, and the substrate more drainable. Graders are used to redistribute rock/gravel by pulling it back to the middle of the road, and then spreading it back over the road to eliminate oversize. On roads with ditches, the grader may be used to clear or clean ditches to allow water to runoff more efficiently. This helps prevent “ponding” in ditches, and/or accumulated water from spilling onto the roadbed. Blading can be implemented so that road materials do not get too far off the roadbed which otherwise can widen the road surface. A roller may be used to compact the road surface following the final blading passes to prevent further sedimentation. Surface blading can temporarily increase sediment production during intense rains and through dusting.

Disposal Site Use – Disposal sites are approved areas where disposal material is placed or held until a later date. Disposal material may be buried or piled and may consist of soil, tree stumps, slash, brush or other items such as old culverts. These sites must be located on stable ground, free of sensitive plants and animals, usually out of view of recreation areas, and suitable for the purpose.

Hazard Tree Removal – **GO TO Mechanical Treatments Activity Type, Harvest prescription/implementation Activity Component, *Dead trees: salvage, hazard tree removal* Work Element** for the description of this Work Element.

Adding Cross Drain Culverts – Cross drain culverts are added to areas where water must travel through excessively long ditches. Depending on the size of the culvert, a backhoe with rubber tires or metal tracks may be used for installation. Depending on the topography and site characteristics, catch basins may also need to be installed. Culverts are installed with a minimum of 1 foot of fill placed over the top of the culvert.

Bridge Maintenance – riprap, deck cleaning, guardrail repair, abutment repair – This may occur on decks and guardrails, abutments and sills, protecting riprap, bridge approaches, ramps, and wing walls when needed. The need for maintenance is often exacerbated by fire and fire activity when they are damaged, weakened, or destroyed. Many of these activities will require the use of mechanical tools and heavy equipment; some of these activities may result in minor increased erosion for a given time period. Heavy equipment operation could contribute to disturbances in an area of concern for wildlife. Newer diesel engines are much quieter than they have been in the past.

Dust Abatement - Water or Chemical – Dust abatement is sometimes necessary on roads not having a hardened or paved surface. This is especially needed when the volume and frequency of use keeps the surface stirred and fines become separated and airborne in the form of dust.

- Water dust abatement is generally accomplished by spreading water on roads with a truck carrying a water tank and a spreader bar attached to the back of the truck. Only approved sources of water can be used for abatement, and sometimes this may require water source development. Water source development must consider volume, time of use, water rights, drain back prevention, sub-grade pad reinforcement, and protection for fish and other resources.
- Chemical dust abatement involves the use of chemicals that help bind the fines and reduce dust and sediment production. These agents are used when the volume and duration of use make water use too expensive. Common chemical agents used for dust abatement are Calcium Chloride Flake, Lignin Sulfonate, Sodium Chloride, Dust Oils (water based), and other soil stabilizing agents made for that purpose. Volatile cut back dust oils are seldom used. Most common dust abatement agents used today are quite non-toxic to fish and animals in normal concentrations. To be most effective the road surface is prepared by blading, applying water, and then applying dust palliative. Traffic is not allowed on the road until the road has cured. Blotter material is used to soak up excessive dust palliative. Measures are taken to prevent splattering in streams and adjacent vegetation. Pump chance areas and water quality are protected from drain back with berms and aggregate pads constructed prior to use.

Surface Rocking (rock replacement) – This is commonly needed for road maintenance. Over time and from a multitude of uses, original surface rock becomes washed, bladed, worn off, and pushed into muddy sub-grade soil. Eventually surface rock needs to be replaced. This is accomplished by loading a dump truck at a commercial source or agency stockpile with surface rock, hauling the rock to a designated site, then dumping the rock out of the truck onto the road. Moving the truck forward distributes the rock over the road, and a grader used to further spread the rock. Subsequently, a roller may be used to compact and harden the road surface. When the aggregate is dry, it is particularly important to add water prior to blading to prevent segregation and facilitate compaction. Spot surfacing may also be implemented under this work element. Spot surfacing is a type of surface rocking and is limited to the dump truck spreading the rock at specific spots and grading.

Slide Removal – This can be accomplished with a grader, loader or bulldozer. On aggregate surfaced roads, the waste material is loaded into a dump truck and hauled to a designated waste area. Large slide removal generally requires the construction of some type of structure to re-stabilize the roadway. Re-vegetation or other erosion control measures are often taken to reduce erosion from the site.

Roadside Brushing – This is done to prevent vegetative growth in the roadbed, and to improve sight distance. Most roadside brushing is done by mechanical removal of trees, branches, and brush. Occasionally, hand tools such as chain saws with regular bars or brushing bars are used. Mechanical brushing is generally done with a road brushing machine that may use a bar or rotating brush head. A number of passes may be made on each side of the road and generally the uphill side takes more passes. Sometimes a pole saw may be needed to reach limbs on the lower

side of the road. Chainsaws are used to cut and remove fallen logs from the roadway and roadsides.

Opening Closed Roads, including logging out, snowplowing - This occurs for special situations such as commercial thinning, prescribed fire activities, fire suppression or fire rehabilitation activity. During emergency situations, closed roads may be opened to allow emergency vehicles and personnel access. Opening closed roads may require removing barriers, knocking down water bars, clearing vegetation in the travel way, snowplowing, and/or reconditioning other roadway features. Temporary culvert crossings of streams may be installed with bedding and clean backfill. Closed roads that have been opened may then need to be closed after use.

- Logging Out - Logging out refers to the removal of downed trees from the roadbed or roadsides; GO TO **Mechanical Treatments Activity Type** for the description of Work Elements to describe logging operations.
- Snowplowing - Snowplowing may be used to open a closed road for emergency purposes. GO TO **Reforestation Activity Type, Access for reforestation Activities Activity Component, *Opening closed roads, including snowplowing* Work Element** for the description of snowplowing.

Ditch Cleanout - Ditch cleaning is necessary when ditches no longer meet the objective of transporting water to the next cross drain or away from a road or culvert. Water running down the road can increase road surface generated sedimentation, and may overload the next drainage structure, causing a fill failure. Grass, brush, and minor debris is left in place to stabilize the surface, trap sediment, and slow the velocity of water, as long as the ditch adequately handles the expected flow without scour damage to other facilities. Excess material generated through these actions is loaded on a dump truck and hauled to pre-approved disposal sites. Sometimes suitable fines are used to replace lost ones in the aggregate surface of the road. A bulldozer or grader cleans ditches by dropping a corner of the blade into the ditch pushing material along. Occasionally an excavator is used to cleanout ditches that have been filled in by large amounts material and/or vegetation. This re-establishes designed road drainages.

Culvert Maintenance - Cleaning culvert inlets or upgrading is done when they no longer effectively handle expected water and storm events. Culverts are also upgraded to better facilitate the passage of fish. *Upgrading* can require replacing a culvert that is too small, changing the inlet structure to better handle flows and debris, or adding more culverts to reduce existing impacts on roadside ditches. Sometime when replacing a temporary culvert in a live stream, backfill such as drain rock is used. This allows for culvert installation directly in the water with no additional compaction needed for the backfill. No additional sedimentation of the stream will result.

Road Restoration

This is a relatively new term and often involves components used for both maintenance and reconstruction. Generally, the function of road restoration is to improve road drainage capacity and to add a margin of safety for increased flow. Restoration can reduce the need for recurrent road maintenance. Additional cross drains, rolling dips and/or enlarging culverts are common restoration measures.

Environmental consequences from fires can put additional pressure on structures and other road features needed for proper functioning. Vegetation can be burned off stabilized slopes and banks, increasing the probability of erosion and mass sliding; very hot burns can cause soils to become hydrophobic. Water yield can be magnified several times over putting increased stress on culverts and drainage capacity. Woody debris becomes mobilized making drainage plugging a problem.

Stormproofing – This involves the implementation of management practices that substantially reduce the potential for erosion, sedimentation, and mass wasting, while still allowing road use. Stormproofing for road restoration may require constructing dips or waterbars, installing additional culverts, and/or upgrading existing culverts with larger, newer, or with special inlet sections and/or debris racks. It may also involve reshaping the roadway, disconnecting ditches (diverting flow – not relying on ditch flow) and surfacing the roadway. Slope stability can be restored with re-vegetating efforts such as seeding, fertilizing, mulching, vegetation mats, or sediment filters. See the Reforestation and Range Infrastructure Activity Types for additional re-vegetation information. Vegetative re-growth and forest litter, now allowed to accumulate on the roadbed, enables the road surface to regain its hydrological function.

Bridge Replacement – Bridges are replaced when they are destroyed by fire or have become too old to function safely. Bridges are also replaced when they cannot provide access and mobility as needed (e.g., updating from single to double lane), and/or when the original design cannot pass anticipated flood flow events. Bridge replacement can range from replacing the decking, deck or the entire bridge including the abutments. Bridge replacement procedures will vary according to the design, size, type and configuration of the bridge. Large cranes and other heavy equipment are used to remove and install bridges. Minor short-term impacts to water quality are likely to occur.

Installation of Drainage Dips and Waterbars - Roadbed drainage features, such as dips and waterbars, are preferred to facilitate roadbed drainage. Dips or waterbars are not “maintenance dependent” like their counterparts, and work almost indefinitely even with minor slumping of cut banks into the roadbed. They have the added benefit of helping to stormproof the road, or providing an added measure of safety for storm events in the event of overtopping. Installing water bars and dips usually requires the use of mechanical and heavy equipment.

Culvert Installation and Upgrade – Culverts are installed where they are needed to reduce soil erosion and run-off. Installation requires procedures be implemented that will minimize sedimentation and turbidity during the installation of in-channel structures, properly accommodate stream discharge, bedload and debris to reduce road failure risk, provide for stream function (by installing a buffering device that intercepts road surface erosion), and provide a fish passage if fish are present. All culverts must be sized to accommodate 100-year flood events. Culvert installation usually requires the use of mechanical tools and heavy equipment such as backhoes, bulldozers, and dump trucks. After a trench to accommodate a culvert is dug, rock may be placed where the culvert will lie in the trench. Fill is placed on top of the culvert in layers that are compacted.

Surface Shaping and Draining – On high traffic roads, surface shaping and drainage are needed to keep the road dry. Simply grading the road usually completes shaping the surface, this allows for proper drainage. See *road blading* (found above) for additional information.

Surface Material Processing – in place rock crushing – Processing surface material can be accomplished many different ways. From crushing operations to blading and re-distributing rock on the road will “process” material. Binder may be added to an aggregate being used to surface the road, and this can be re-mixed while it is being graded on the road surface. Rock pit plans are designed to minimize adverse effects of excavation and processing of rock materials. The plans will cover erosion control measures needed during and after pit preparation.

New Construction/Reconstruction

Locating stable slopes, avoiding wetlands, and choosing areas where proper drainage can be accomplished are necessary for any new road construction or reconstruction. New construction or reconstruction may include clearing, excavation, embankment, installation of drainage features and structures, and sometimes surfacing and re-alignment.

Vegetation Clearing – pioneering activities – Trees, brush and all other vegetative materials are cleared from the area so that roadbed construction can begin. Bulldozers, graders, backhoes, and power tools such as chainsaws and roadside brushers may all be used. Vegetation is seldom cleared beyond the top of a cut, or fill toe. Sometimes vegetation is left in the lower section of the fill area on temporary roads.

Installation of Drainage Features – includes bridge construction - Under fill drainage refers to installing culverts and bridges. These structures may be permanent or temporary, and are designed to allow for fish passage when needed. They help reduce sedimentation in streams during construction, as well as avoid erosion after construction. Culverts used on fish-bearing streams are all designed for 100-year flood events. The diversion of water around the culvert installation site is done to protect water quality. De-watering occurs when working in the stream channel. Sediment fencing, other erosion control measures, or the use of clean “drain rock” bedding and backfill (at least halfway up on culvert) is used during culvert installation.

Earthwork - Excavation and embankment refers to building a road out of the slope of the ground. This requires excavation, hauling of material, and filling across drainages and depressions.

Finish – Many different types of “finishes” may be used to complete the surface of a road. Some roads may only need a “dozer finish” and other roads may need an asphalt finish. The majority of roads on Forest Service and Bureau of Land Management lands have a grader finish.

Surfacing - Surfacing is designed to meet anticipated road use. Native surfacing is generally used on low volume roads. On occasion, aggregate is used to help stabilize moisture-sensitive sub-grades and protect against erosion on erosive surfaces.

ACTIVITY TYPE: Threatened, Endangered Species Habitat Restoration

These projects cover a wide variety of habitat restoration and enhancement activities for wildlife, fisheries, and plant species. Activity components with primary objectives covered by other activity components are not detailed here. These include road re-location, road decommissioning, road maintenance, road restoration/storm-proofing, thinning of forested stands, prescribed fire, and watershed restoration techniques such as in-channel erosion control structures.

Heavy equipment, including helicopter operations, and the use of power tools are often needed for many instream and aquatic restoration projects and their operation. Access sites and provisions must be made to haul and use heavy machinery. All of these activities would require the presence of crews at a site during the time required to accomplish the work. Most instream restoration activities and some streamside activities would create additional temporary sediment loading.

Related Work Elements may be found in the following Activity Types: **Range Infrastructure** regarding fencing, water source/spring construction, and reseeded; **Roads and Roads Maintenance** regarding decommissioning and obliteration; **Prescribed Fire** regarding fire; **Mechanical Treatments** regarding tree removal; **Trails and Trail Maintenance** regarding trail construction; **Reforestation** regarding seed collection; and **Access and Equipment Maintenance** regarding access and fueling.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Instream Restoration

Helicopter Operations – GO TO **Prescribed Fire Activity Type, Helicopter landing sites and other operational facilities Activity Component, *Helicopter support sites: refuel, alumigel mix sites, etc. Work Element*** for the description of ground support and helicopter maintenance operations. GO TO **Access and Equipment Maintenance Activity Type, Access to Work Site Activity Component, *Access by helicopter/aircraft Work Element*** for the description of helicopter flights.

Hilti Drill Operation – This drill is used to install instream structures.

Mulching for Erosion Control – Localized mulching may be used at disturbed sites, and larger areas of erosion control may be needed if there are large areas of bare soil (e.g., as a result of major channel reconstruction or bank disturbance). Within the **Watershed Restoration Activity Type, GO TO **Revegetation Activity Component, *Mulch Application Work Element*** and **Hillslope Erosion Control Activity Component, *Erosion control mulch or blankets Work Element*** for the description of this Work Element.**

Placement of Boulders or Large Woody Material – GO TO **Watershed Restoration Activity Type, Sediment Control Activity Component, *Instream log structure*** for the description of this work element.

Power Saw Operation – The operation of hand-held power saws. See the **Access and Equipment Maintenance Activity Type, Fueling/Maintenance Activity Component, *Fueling/maintenance of light equipment on site*** for additional information regarding fueling.

Seeding For Erosion Control – GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component**, for Work Elements describing this activity.

Meadow Restoration

Fence Construction – GO TO **Range Infrastructure Activity Type, Fence Construction/reconstruction/maintenance Activity Component** for Work Elements describing this activity.

Mowing - Tractors with mowing implements may be used to mow vegetation along roadsides, and in rangelands with dense shrubs or grasses. Although mowing does not remove roots, it helps eliminate undesired plant species by giving desired plants a competitive advantage. If mowing or brushbeating occurs in Sage Brush, GO TO **Prescribed Fire Activity Type, the appropriate Sage Brush Activity Component (e.g. Mountain big sagebrush fire regime II), *Mowing/Brushbeating Work Element*** for a description of this Work Element.

Riparian Improvement

The objectives of riparian restoration are to provide vegetative cover, protect soils, provide wildlife habitat including forage and browse, reduce stream temperatures, provide bank shade/cover, and improve local site hydrologic characteristics (e.g. water table depths).

Typical work elements include planting native shrub and tree seedlings, tall tree planting, and forb/grass seeding. Native plant sources are desired and are usually used, but in circumstances where soil profiles are highly modified, non-native plants may be used. Typical implementation consists of hand planting, localized site preparation, use of power tools, and sometimes machinery for seed drilling or tall tree planting. See the **Range Infrastructure Activity Types** for activity components and work elements used to re-seed and replant areas.

Native Plant seeding – GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component**, for Work Elements describing this activity.

Non-native plant seeding - GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component**, for Work Elements describing this activity.

Placement of small trees, shrubs, seedling - Woody plant material is placed in riparian zones to increase vegetation diversity. It has benefits to both fish and wildlife through providing a food source, a cover source or reducing stream temperatures. Placement of small trees, shrubs, and

seedlings can occur by various methods. This activity ranges from small projects to large projects. A small project may consist of one or two persons walking along a stream course placing willow cuttings by hand without machinery. A larger project may involve a crew of up to 14 people hand operating power equipment and using a truck mounted auger to bore holes to place large material, such as tree stems up to 6" in diameter. This work generally occurs in early spring (sometimes late fall) and people are present on a given acre for a very short time period (less than one day).

Snag Creation

Tree Climbing – GO TO **Reforestation Activity Type, Collection of Plant propagation materials Activity Component**, *Climb to access or mechanically pick cones Work Element* for the description of this Work Element.

Inoculation – GO TO **Insect and Disease Suppression Activity Type, Ground application of pesticides Activity Component**, *Back-pack spraying or inoculation of individual trees with insecticide* for the description of this Work Element.

Girdling Trees – Trees are girdled by carving a ring around the tree bole interrupting the cambium function.

Tree Topping – GO TO **Insect and Disease Suppression Activity Type, Manual Treatments Activity Component**, *Topping or otherwise killing and removing infested trees Work Element* for the description of this Work Element.

Brush Pile Construction

GO TO **Mechanical Treatments Activity Type, Rehabilitation, removal of excess vegetation and slash Activity Component** for the description of Work Elements related to piling. GO TO **Mechanical Treatments Activity Type, Tree Felling Activity Component** for the description of Work Elements related to tree felling.

Contour Felling

GO TO **Watershed Restoration Activity Type, Hillslope erosion control Activity Component**, *Contour felling Work Element* for the description of this Work Elements.

Exclosure Construction and Maintenance

GO TO **Range Infrastructure Activity Type, Fence construction/reconstruction/maintenance Activity Component** for Work Elements describing fencing activities. GO TO **Access and Equipment Maintenance Activity Type** for Work Elements describing equipment operation.

Fish Population Recovery/Enhancement

Improving and protecting fish habitat is part of the fisheries programs of most administrative units. When areas have been burned, work may be required to repair structures that have been damaged or destroyed and protective measures may need to be taken to prevent further damage to fisheries habitats.

Fish Barrier Installation or Removal - The addition of large woody material and placement of instream boulders may be needed for cover, channel complexity, bedload collection and sorting (e.g., improve spawning habitat). Replacement and/or upgrading of existing culverts may be needed to provide fish passage and for potential 100-year flood events. In some cases, the reduction of instream wood loading is required to allow for fish passage. The installation of barriers to prevent movement of undesired non-native fish may be necessary.

Exotic Species Removal - Trapping (fish) – A primary method for removing fish by mechanical means is electroshocking (see below, *Fish electroshocking*). Trapping and netting fish are alternative methods that produce variable results. Both traps and nets are labor intensive and the specific gear type depends on habitat (e.g., seines require smooth bottoms and trap, or net, types may differ if used in lakes rather than streams). Gear types may include minnow traps, trammel nets, gill nets, fyke nets, weirs and seines. Traps usually result in little to no bank disturbance (e.g., a location to tie down the trap), although a temporary weir may result in bank disturbance. Different fish species and sizes have differing vulnerabilities to any given net or trap. Injury to fish depends on mesh sizes, length of time the net or trap is set, increased risk of animal predation (e.g., river otter or larger fishes), and human handling. Mesh sizes may be used to attempt to not catch certain species or age classes, but, depending on the size of fishes in a given community, non-target fishes may be caught. Nets and traps must be tended in a manner that reduces risk of fish being exposed to predation. Fishes that are not a target for removal, but that swim into a trap and cannot escape, sometimes require human handling that increases stress on the fish. The number of non-target fish that may be released with little to no handling depends on the gear type.

Exotic Species Removal - Rotenone and antimycin A (Fintrol) - These two chemicals are EPA registered restricted use pesticides. Proper use is done according to the labels. Use depends on estimating stream flow so that a proper dosage can be added to the water in drip stations or by backpack sprayer. Both chemicals are neutralized by potassium permanganate. Fish cellular systems (e.g., oxygen uptake) are interrupted resulting in death. Both rotenone and antimycin have other ingredients so that they may be water soluble (i.e. naphthalene for rotenone and acetone for antimycin A). Dead fish must be removed and disposed of. Two or three treatments are sometimes needed. At concentrations used for fish eradication, both chemicals are toxic only to gill breathing animals.

Interpretation/Conservation Education

Many projects have a component that interprets the ecological recovery of severely burned areas. Work components include signing, viewpoint and trail access, and associated parking and restrooms (the infrastructure development). Generally, these actions will be adjacent to already developed roads. See the **Recreation Facilities and Operation, Access and Equipment**

Maintenance, and Trail and Trail Maintenance Activity Types for additional information on related activities.

Signing - Complexity of sign placement varies from simply placing paper signs on tree trunks with a staple gun to potentially constructing a kiosk with display panels. The placement of small signs on tree trunks may be to inform or direct visitors that are in the area already. Larger display signs may require a small construction crew for up to 5 days. These larger displays are meant to draw visitors, possibly all year long. After the construction human presence may increase dramatically.

Viewpoint Construction

Within the **Recreation Facilities and Operations Activity Type**, **GO TO Existing facilities developed and dispersed** and **Installation of other site amenities Activity Components** for the description of this Work Element.

Trail Access / building

GO TO Trails and Trail Maintenance Activity Types, Construction/reconstruction/heavy maintenance Activity component for the description of trail building. **GO TO Access and Equipment Maintenance Activity Type, Access to Work Site Activity Component** for the description of trail access.

Monitoring Fish and Wildlife

Fish snorkeling or underwater video - Snorkeling consists of one or more persons outfitted to conduct underwater counts of fish. Fish may leave their territory or station within the water column depending on the proximity of the person. Underwater video would be similar in disturbance, but less often used due to needs for special equipment. Both methods would be limited to streams with proper visibility.

Channel condition surveys, fish habitat inventory - These methods primarily consist of two to three people walking a stream on both the banks and in the stream. Measurements or estimates obtained include channel unit lengths, widths, depths, number of pieces of wood, and special features such as culverts and waterfalls. Disturbance to fish eggs and amphibians can occur, depending on the season of fish reproduction. Surveys are primarily done in low water conditions, such as summer and early fall.

Use of snowmobiles - **GO TO Access and Equipment Maintenance Activity Type, Access to work site Activity Component, Access by vehicle or ATV off roads or outside of normal use patterns Work Element** for the description of this Work Element.

Wildlife and fish telemetry - This activity involves the placement of a small radio transmitter on a particular animal and then periodically re-locating that animal to gain information on movements, survival, habitat selection and other desired parameters. The act of re-locating the animal can be done several ways. Most commonly the re-location is gained using a portable radio receiver and hiking in an area where the animal is likely to be located. Locations can also

be gained remotely through the placement of fixed antennas, the use of aircraft, and though the use of satellite receivers. This activity can occur year-round.

Wildlife denning/nesting surveys - Determining the location of animal dens or nests is accomplished through many methods, depending on the species of interest. Commonly the searches are conducted on foot or by vehicle (e.g., ATV, snowmobile or aircraft). The search would cover an area suspected of containing a den or nest of interest. These surveys are normally conducted late winter through summer.

Direct wildlife observation - Direct wildlife observations are those conducted to determine the presence or absence of a species, and sometimes its relative abundance. Observation is most commonly conducted by foot, but occasionally vehicles or aircraft may be used. This activity is conducted year-round depending on the species in question.

Aerial wildlife counts - Aerial wildlife counts are usually conducted to gain an index of animal population numbers and distribution. Most methods used to look at estimating population require counts to be done in the winter or early spring. Helicopters and fixed wing aircraft that are used to conduct these counts usually use low flight levels.

Redd counts - Redd counts are usually conducted by walking a stream to note the number of nests that a female salmonid has excavated and laid eggs in. The surveyor may walk on the bank, or may have to walk in the stream, but redds are often visible enough to avoid disturbing them. Helicopters and boats have also been used to conduct redd surveys.

Fish electroshocking - Electroshocking consists of stunning fish with electric current (alternating or direct). Non-target species would be susceptible to electroshocking, including small mammals that may be in the stream (e.g., vole, mouse, beaver). Given proper knowledge and training, very little mortality is associated with electroshocking, however injury can occur (especially to larger fishes). Injury might consist of bruising of the muscle or breakage of the spinal column. Monitoring with electroshocking may entail three passes through a stream reach to obtain statistically valid estimates of fish populations. Minimum monitoring (e.g., presence/absence or size structure) may entail only one-pass. During three-pass electroshocking, fish are removed from the stream reach with each successive effort (and the reach is blocked with nets to provide a closed population). Fish must thus be kept streamside (usually in buckets) until weighed and/or measured and until the final pass is complete. If fish are weighed and/or measured (as opposed to a numerical count and size estimate) further stress can occur from human handling. Non-target species of fishes may be left in the water under a one-pass or three-pass method. Fish that are being monitored and removed from the stream under either system are put back into the water after they have been weighed and/or measured.

Quarry Restoration

Waste Storage – General waste created in quarrying is usually either topsoil (dirt), which is stockpiled, or tailings (rock, gravel), which are usually stored separately. Toxic waste generated from a quarry site is required to be stored in containers that prevent it from escaping into the environment. In older quarry sites, toxic chemicals were used to extract the object mineral (e.g.,

cinnabar). These older quarries may contain toxic materials such as mercury and cyanide. During restoration, contaminated soil is removed prior to contouring and re-vegetation. These activities may require hand tools and/or large machinery, depending on the size of the quarry.

Seeding – GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component**, for Work Elements describing this activity.

Road Decommissioning

GO TO **Roads and Roads Maintenance Activity Type, Decommissioning Roads Activity Component** for Work Elements describing this activity.

Road Obliteration

GO TO **Roads and Roads Maintenance Activity Type, Decommissioning Roads Activity Component** for Work Elements describing this activity.

Spring Restoration and Repair

GO TO **Range Infrastructure Activity Type, Water development construction/reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells) Activity Component** for Work Elements describing this activity.

Thinning

GO TO **Mechanical Treatments Activity Type, Harvest prescription/implementation Activity Component**, *Understory/single story treatments: thinning Work Element* for the description of this Work Element.

Water Source Construction

GO TO **Range Infrastructure Activity Type, Water development construction/reconstruction (springs, guzzlers, tanks, ponds, reservoirs, wells) Activity Component** for Work Elements describing this activity.

Aspen Restoration

If this project involves fencing, GO TO **Range Infrastructure Activity Type, Fence construction/reconstruction/maintenance Activity Component** for Work Elements describing fencing activities.

See the **Reforestation, Prescribed Fire and Rangeland Infrastructure Activity Types** for additional activity components and work elements that may be used to implement aspen restoration.

Mechanical Root Shearing – Mechanical root shearing is used to remove large numbers of trees and stumps over four inches in diameter. Modified bulldozer blades are normally used for this activity to sever stumps and standing trees at ground-line. This treatment can clear as much as a 12-foot corridor in one pass.

Prescribed Fire – GO TO **Prescribed Fire Activity Type** for Work Elements describing this activity.

ACTIVITY TYPE: Trails and Trail Maintenance

ACTIVITY COMPONENTS AND WORK ELEMENTS

Construction/Reconstruction/Heavy Maintenance

Trail construction could involve a number of activity components and work elements depending on the type of trail needed to meet the recreation objective and constraints involving soils, terrain, and other resource concerns. Trail development could range from merely mowing the trail, to the use of a trail builder machine (trail dozer) and compacter. Construction activities typically include clearing and grubbing, trailbed excavation and building turnpikes, punchcons and switchbacks. Structures such as bridges and rock retaining walls may be constructed, and depending on the site's drainage abilities, the work may require the installation of water bars, grade dips, and/or culverts.

Trail reconstruction could require the use of power and/or hand tools as well as heavy equipment. The most common reconstruction activities include adding drainage dips, check dams, or rock spillways; or removing sloughs or berms. Tread relocation may be needed to avoid bogs, slumps, or other moist areas. This requires establishment of new trail and the closure/restoration of old trail. The tools needed to construct trail may include heavy equipment, power or hand tools, or both.

Access to the site and the movement of personnel and equipment and supplies will also vary among trail types. The time required to construct or reconstruct a trail will depend on the crew size, the intensity of the work and the location. For example, because only hand tools can be used in wilderness areas, this may increase the amount of time that crews would be present in an area. Hand-held tools include anything that can be carried to the site and held in the hand to operate including a chainsaw, crosscut saw, Pulaski, and/or a hoe dad. Machinery also requires an operator and such examples include backhoes, small tractors, ATVs, and other vehicles designed for trail tread construction and repair.

Related Work Elements may be found in the following Activity Types: **Access and Equipment Maintenance** regarding access and fueling; **Mechanical Treatments Activity Type** regarding tree falling.

Horses/Weed Free Hay – If stock is used to pack in material for building trail, the agency is required to use certified weed free feed. On almost all public lands in the west, the public and agencies are required to use certified weed free hay or pellets for livestock.

Camping – The selection of camping sites may be needed for crews that remain on or near the work site while conducting trail maintenance, construction or reconstruction. Effects may include: temporary disturbance, prolonged disturbance, and soil erosion, compaction or sedimentation. Usually agency crews are familiar with minimum-impact camping techniques and will choose a campsite that is already established or a site that is resistant to vegetation loss and soil compaction. GO TO **Prescribed Fire Activity Type, Fire support Activity Component, Fire/spike camp Work Element** for the description of this Work Element.

Trail Decommissioning – Decommissioning may require obliterating the trail so that no sign of the trail remains. This may require scarifying, ripping, and seeding, bringing in brush, or the construction of barriers. The objective would be to allow the area encompassed by the trail to become part of the native surface and terrain. This may require the use of hand and/or power tools as well as heavy equipment. Most frequently, backcountry trails are closed to prevent use and allowed to re-vegetate naturally, unless there is a high degree of concern about erosion or weeds.

Ford Maintenance/Construction – This typically involves stabilizing streambanks to prevent erosion and sedimentation. This may be accomplished with native materials (usually rock) or concrete slabs. See **Watershed Restoration Activity Type, In-Channel Erosion Control Activity Component** for additional information.

Gravel Borrowing/Borrow Pit – This involves the removal of small amounts of gravel from sources that are either established for that purpose, or can that be easily restored. Where soil types are favorable the borrow material often comes from the immediate site – if it is removed for ditching and drains it can be placed as turnpike material. Tools needed may include heavy equipment, power or hand tools, or both, depending on location and type of trail.

Reseeding Edges/Bank – Edges and banks along the trail may need reseeding because of wear. Areas may require some scarification of the seedbed. Native seeds or seedlings may be used or an annual fast rooting species may be used to stabilize the bank until native vegetation re-establishes itself. In most mountain applications, where seeds are slow to establish and native forbs and grasses have long-lived roots systems, introduction of root-rich soil from the local area is successful at re-establishing ground cover. This treatment, at least in backcountry settings, is labor-intensive and therefore only used for small areas so the disturbance is slight and hand tools are usually the most appropriate. See the **Watershed Restoration Activity Type, Re-vegetation Activity Component, and Range Infrastructure Activity Type, Rangeland Restoration Activity Component**, for additional information.

Tread Construction – Tread is the area over which most direct travel occurs. Tread may consist only of native material or may consist of non-native surface (such as gravel). Trail tread may extend to the entire width of the trail or some other width depending on the composition of the tread.

Bridge Building – Bridges are designed to support the maximum snow load, snow grooming equipment, or pack and saddle stock. Materials such as gabions, lumber, or steel for beams and other heavy items are often flown into the backcountry by helicopter if they are too large or too heavy to pack. In areas near roads, heavy equipment is more likely to be used to set gabions, excavate, pour concrete, and set beams.

Trail Relocation away from Meadows – Relocating a trail out of a wet area, or sensitive dry meadow, may require all activities related to building new trail and decommissioning old trail.

Puncheon/Turnpike Construction – Puncheons and turnpikes are used to stabilize trailbeds in areas with high water tables and relatively good soils. Ditches are excavated on each side of the trailbed and the excavated material is placed on the trailbed to raise the trail grade above the surrounding water table. It is often necessary to bring borrow material to complete turnpike construction. If the ground is wet, turnpike sections will be allowed to sit through the winter and spring seasons to permit full consolidation before use. Geotextiles may be used in turnpike construction to improve the turnpike's effectiveness.

Culvert Installation – This consists of furnishing and installing culverts made of non-native material and/or rock culverts. The work includes backfilling and constructing of catch basins and headwalls. Pipe is laid in a stable foundation of undisturbed or compacted soil and headwalls are constructed at the inlets and outlet ends of pipe. In all locations except where turnpikes are laid, culverts are extended from stream bank to stream bank and are horizontal on top.

Blasting – surface, subsurface and aerial – The extent and implementation of blasting depends on the amount of material to be removed and the location of the trail. Typically, in backcountry settings a protruding outcrop or boulder will be removed with relatively small charges. Few trails are being constructed these days that require full-bench cuts in bedrock. In wilderness areas, hand drills are used; outside of wilderness areas hand and power equipment can be used.

Major Tread Reconstruction (blowout repair, large cribbing projects) – Tread is the area over which most direct travel occurs. If significant damage to tread has been incurred, material may have to be hauled to the site to repair the tread; corresponding drainage features may also need to be repaired or reconstructed. Large cribbing projects or retaining wall installation will require the use of fill. The fill may be obtained from a nearby borrow pit, or it may need to be hauled to the site.

Light Maintenance

Light maintenance is needed to preserve trails and their related facilities. This may involve a number of activities including but not limited to: installation, clean out and repair of drainage features, removing trees and stumps, protruding rocks, roots, berms and sloughs. Filling ruts and troughs, reshaping backslopes, constructing drainage ditches, finishing treads, and spot filling may also be needed along the trail. These activities could include use of either non-mechanical or light mechanical equipment (e.g., bobcat-sized dozers, post-hole diggers, hand-held

machinery). Activity occurs within trail prism and all materials are left on site.

Hazard Tree Removal – **GO TO Mechanical Treatment Activity Type, Harvest prescription/implementation Activity Component, Dead trees: salvage, hazard tree removal Work element** for the description of this Work Element.

Installation, Cleanout and Repair of Drainage Features (waterbars, dips, etc.) – When debris and other unwanted material build up in dips, cross-check culverts, or waterbars, improper water run-off and soil erosion can occur. Debris and other material are removed during maintenance activities to allow for proper hydrological function along trails. See the **Watershed Restoration Activity Type** for additional information.

Signing (blazes, rock cairns, sign posts) – Signs are used for trail operations and are installed or replaced as needed. Blazes are typically chiseled into a tree bole in a standard heel-and-toe style and may be painted to indicate trail routes. The practice of marking trails with blazes is rarely used anymore. Cairns consist of rocks placed in layers that slope to the center of the structure so that it forms a rough pyramid that can be seen from some distance. Some are built to support signposts and others are used as barriers. Generally, rocks used to construct cairns are gathered near the site. Sometimes they are hauled to the site. Posts for signs may be hauled to a site or they may be produced from nearby trees. This activity may require the use of a chainsaw, posthole digger, auger, and/or pounder.

Repair of Structures Near Water (bridges, stream fords) – Repairing trail structures near water may require the implementation of measures to prevent erosion and sedimentation during and after the work activity. This work would likely require the use of machinery, depending on the type of repair work to be done, and the location of the bridge.

Repair of Land Structures (puncheons, turnpikes, steps) – This work may require the use of hand and/or mechanical tools as well as heavy equipment such as a trail machine.

Minor tread reconstruction – Sections along a trail may need surface repair. Wet areas may need to be hardened with gravel and/or puncheon and turnpikes may need to be installed. Tread reconstruction may be done with manual and/or mechanized tools. Constructing trail tread may require hauling non-native material such as gravel or soil, or by using a Pulaski to expose bare soil. Sometimes a protective aggregate may be applied to the trail surface.

Log Clearing and Brushing - Non Mechanical – This could require the use of non-powered hand tools such as the Pulaski, saws, and sickles to remove vegetation and commonly used in remote settings and wilderness.

Log Clearing and Brushing - Mechanical – Chain saws and motorized brush cutters may be used to conduct this maintenance activity outside of wilderness areas.

Excavating Material Near Water (gravel bar) – Material may be excavated adjacent to water sources, or within riparian zones, when fords are constructed or repaired or bridges and other structures are installed for the trail.

Excavating Material (borrow pits, trenches) – Material will be excavated from borrow pits, or trenches and used to “spot repair” tread, or other features in need of maintenance or repair along a trail.

Debris Removal – Debris can be removed with rakes, or any other tools that will facilitate the removal of leaves, twigs, loose soil, rock or other gathered material on a trail, or within structures related to the proper function of the trail.

ACTIVITY TYPE: Watershed Restoration

Watershed restoration activities are intended to repair and monitor fire impacts and restoration treatment effectiveness. Work activities include control of hill slope or channel erosion, watershed stability enhancement, and monitoring of fire impacts and effectiveness of restoration treatments. Treatments are primarily designed to reduce soil loss in burned watersheds and minimize adverse impacts on water quality and aquatic and terrestrial habitats. Techniques described here can be used in watersheds with forest, shrub and grassland habitats to control both storm runoff and erosion.

Mobilizing crews and equipment transportation would typically occur on existing roads. Equipment may require off-road travel to access work areas. Remote work sites may require crew camping near work areas. Related Work Elements may be found in the following Activity Types: **Access and Equipment Maintenance** regarding access and fueling; **Roads and Roads Maintenance Activity Type** regarding road obliteration; **Prescribed Fire** regarding camping.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Hill slope Erosion Control (Erosion control for slopes)

Erosion control treatments are implemented to reduce or slow surface runoff and soil erosion. Some are specifically designed to reduce soil compaction, increase water infiltration, and recover site productivity. These include activities in upland areas or riparian areas.

Gully check structures: install straw bales, logs, silt fences - Material is placed in existing gullies, or areas of high potential for gully formation (coalescing rills), to impede further downcutting or initiation. On-site or nearby material (logs, limbs, brush) may be used when available; if not, generally biodegradable material is brought in (straw bales; silt fencing). This is normally hand placed with log ends sometimes secured into the gully or hillside, although machinery may be used if operationally feasible.

Trenching - Hand or machine work to create a surface slope break to intercept overland flow (and effectively shorten slope length) by a contour trench. Trench width and depth typically depends on the tool used. Hand shovels, or the digging side of a Pulaski, are the most common trenching tools and dictate the width and depth of the trench. In some cases, a backhoe may be

employed and the trench sized according the bucket size. Waste soil/material is placed on the downhill side as a terrace.

Terracing - Hand tools or machinery is used to move soil into contour rows to break slope length, slow velocity of overland flow, and provide some sediment storage. Size of terraces depends on slope length and steepness and soil type. Terrace height in wildland situations typically ranges from 4 to 18 inches with similar base widths. Terraces may sometimes be constructed with sandbagged soil. Soil is usually shoveled from the immediate area into sandbags to form a terrace. This is usually only undertaken in areas with coarse-textured soils.

Slope ripping, sub-soiling - GO TO **Mechanical Treatments Activity Type, Reducing soil compaction Activity Component, Subsoiling Work Element** for the description of this Work Element.

Erosion Control Mulch or Blankets - Applying mulch helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling. Mulch can be applied by manual or mechanical means depending on the need.

Contour felling - Trees (usually fire-killed) are cut and dropped on-site and placed on the contour to impede overland flow and provide some sediment storage. Construction may involve limbing of fallen trees and trenching to provide a bed for the logs to ensure soil contact and avoid undercutting.

Road / landing ripping - Heavily compacted road or landing areas are mechanically tilled or fractured with a rock ripper, chisel, or subsoiler mounted on a tractor. May be done by hand if treatment is limited in extent and depth of compaction. Subsoilers are designed to fracture compacted layers with minimal surface plowing or mixing.

Install wattles - Straw wattles are long mesh tubes filled with straw, or occasionally hay, that are laid on the contour of slopes to detain overland flow and collect sediment. They are typically installed by hand after being carried on-site by hand, and are usually anchored in place with wooden stakes. Rarely involves mechanized transportation off-road. Transportation may be by helicopter in slings.

In-Channel Erosion Control

Log, Root Wad or Willow Bundle Revetments - These are installed as gradient control measures. A revetment is an armoring wall or barrier protecting stream channel walls from erosion or (further) scouring. Although ‘Riprap’ made of rocks is a classic example, this activity uses vegetation (i.e. logs, root wads and/or willow bundles) as a bioengineering technique.

Reshape Streambanks and Incised Channels - Treatments designed to reduce streambank erosion and enhance channel stability may be implemented in active channels and floodplains. This activity typically involves machinery (typically an excavator) to reconfigure stream channels or merely shape the banks (see below, *Lay Back Vertical Banks*,). This activity ranges

from use of handwork with shovels on small channels to use of heavy machinery to implement large meander adjustments based on ‘Rosgen-style’ calculations.

Lay Back Vertical Banks – Laying back the bank is needed when the bank slope is too vertical and sloughs into the stream. These procedures help reduce the bank’s vertical slope, thus reducing erosion and channel undercutting. Hand tools or machinery (tracked backhoe/excavator) are used to pull material away from the channel to limit additional calving of banks. The banks are smoothed back from the channel to allow gradual rising of water levels and reduction of water velocity that otherwise would erode vertical or overhanging banks.

Install Barbs - Installing barbs also helps to reshape banks and incised channels. Barbs are generally logs anchored to the streambanks. They extend into the stream channel and slow down or redirect water flow helping to create such features as pools.

Structural Bank Controls (riprap, etc.) - Structural bank control or shaping can be treated with the placement of riprap.

Re-vegetation

Re-vegetation treatments are designed to establish ground cover, improve infiltration, and restore site productivity. The activities may be implemented on upland slopes, riparian areas and along streambanks.

Seeding – Aerial or Hand Application – Seeding techniques include hand and aerial broadcast. GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component, Seeding – aerial Work Element** for a description of aerial seeding. GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component, Seeding – disking, drilling, fertilizing, plowing Work Element** for a description of non-aerial seeding.

Site Prep - Surface Scarification, Tilling, Ripping – These activities are implemented for seedbed preparation. For salmonids, criteria will be found under this Work Element; for all other species, criteria will be found under: **Range Infrastructure Activity Type, Rangeland Restoration Activity Component, Seeding – disking, drilling, fertilizing, plowing Work Element** for tilling; **Reforestation Activity Type, Site Preparation Activity Component** for Work Elements for scarification; **Mechanical Treatments Activity Type, Reducing Soil Compaction Activity Component, Subsoiling Work Element** for ripping. GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component, Seeding – disking, drilling, fertilizing, plowing Work Element** for a description of tilling. GO TO **Reforestation Activity Type, Site Preparation Activity Component** for Work Elements describing scarification. GO TO **Mechanical Treatments Activity Type, Reducing Soil Compaction Activity Component, Subsoiling Work Element** for a description of ripping.

Planting Upland and Riparian – Grass, forb, shrub, tree - GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component** for Work Elements describing seeding. Other activities covered by this Work Element are described as follows. Riparian and

upland areas (with grasses, forbs, shrubs and/or trees) may be planted with transplanted nursery stock and/or local plant materials. Normally, species used for seeding or seedlings are native to the area, however, non-persistent, non-native species may be used where objectives require rapid ground cover establishment. Plantings may be done by hand or with machinery. See the **Reforestation Activity Type** for additional information related to planting.

Mulch Application - Applying mulch helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling. Mulch can be applied by manual or mechanical means depending on the need.

Hanson Dibble – This non-mechanized tool is used by an individual to plant tree and shrub seedlings in all types of soils and on all slopes. It is often used in rangelands.

Road Obliteration

Obliteration treatments for watershed restoration purposes include re-contouring. Full re-contouring means replacement of sidecast, or replacement material back onto the roadcut to restore the original slope angle. Re-contouring normally requires heavy equipment such as excavators.

GO TO Roads and Roads Maintenance Activity Type, Decommissioning roads Activity Component for Work Elements describing this activity.

Sediment Control

Structures (e.g., instream log structures) are designed to detain, control, or remove increased sediment in highly impacted burned watersheds. Rebuilding and maintaining instream structures helps protect and maintain instream basins. Structures are constructed and placed by crews using equipment and/or hand crews. Maintaining structures requires sediment removal and disposal by equipment and/or hand crews depending on size and location of structures.

Maintain instream basin - Tracked backhoe (excavator) or other machinery is used to remove collected sediment and debris from constructed basin. Small structures may be cleaned by hand. Structural maintenance may be by machine or with shovels patching or shoring weak spots, damage or leaks.

Construct instream basin (impoundment) - Catchment basins are constructed to collect mobilized sediment and debris. They are often made with tracked backhoes (excavator) or, less often, bulldozer or by hand using on-site soil and rock material. Occasionally involves dump trucks to transport in material

Instream log structure - Instream structures using logs (usually from on-site). Log structures vary from single log or multiple logs. They may be simply felled into the stream (typically intermittent channels) or may be cabled to rocks or standing trees nearby. Log ends may be dug

into channel sides to anchor in place. Some installations may involve using machinery in the channel for short periods of time. Many installations will be in dry channels and done by hand.

Watershed Monitoring

Work activities designed to measure vegetation recovery, soil condition, stream channel condition, and water quality may be needed to monitor watershed conditions, and recovery following environmental events such as fire.

Establish/monitor erosion plots – Installation of erosion monitoring plots for sediment collection typically involves use of hand shovels or other tools to anchor silt fencing or collection boxes. Visual observation plots may only require driving a locating monument (stake) or temporary flagging.

Install gage – Gage installation for post-fire monitoring typically means simple placement of a water depth measure rod near the stream channel or the installation of weather station(s). These usually involve simple hand digging in to secure placement of a measuring rod or small weather monitoring station including precipitation gages and electronic warning devices. Occasionally, water flow and depth gages are installed which may involve trenching and securing of gage and housing in or adjacent to stream channels.

Instream water/sediment collection – This may be occasional hand collection of water samples or involve installation of an automated water/sediment/temp sampling device. These are typically housed in metal barrels or small wooded houses and require some trenching and anchoring of the housing and sampling lines.

Manual instream measurements – Typically involves measuring water flow or stream morphology by cross-section characterization. Water flow measures typically require wading of the stream and insertion of flow measurement rod into the stream channel. Stream channel measurements require rod and level measurements across the stream channel from bank to bank with the rod person wading the stream to take readings at regular intervals.

Monument Plots – Typically requires digging or driving of stakes or other locating devices to ensure long-term identification of specific spots on the landscape for monitoring purposes or land-line location.

ACTIVITY TYPE : Weeds and Chemical Treatments

Noxious weed management includes the use of herbicides, manual, mechanical, biological, and cultural treatments. Rehabilitating a site following treatment is also a part of noxious weed management. Weed treatment may be necessary on rangelands, in timber harvest areas, along roads and road rights-of-way, along trail routes, at dispersed and developed recreation sites, and on other disturbed sites (i.e. fires, flood events). Many treatments are needed during post fire conditions; some are used to reduce the risk and severity of wildland fires. The type of treatment

used depends on site characteristics, weed species present, and management objectives ranging from containment, to control, and eradication. Containment is used to prevent weed spread to beyond the existing infestation perimeter. Control objectives strive to reduce the extent and density of a target weed. Eradication focuses on complete elimination of the weed species including reproductive propagules.

All vegetation treatments conducted for control of noxious weeds are done in accordance with the corresponding agencies' policies, regulations, and product label requirements. Federal agency policy requires the use of specific design features, when in close proximity to sensitive areas, to insure vegetation treatments do not have an adverse impact on non- target plants or animals. Treatments methods include: herbicide, manual, mechanical, biological, prescribed burning, seeding, or any combination of treatment methods.

Ground based application may include the use of backpack sprayers or vehicle-mounted or ATV sprayers (boom or spot gun) to treat noxious weed infestations. Aerial applications require the use of helicopters or fixed wing aircraft mounted with sprayers to treat noxious weed infestations.

Related Work Elements may be found in the following Activity Types: **Access and Equipment Maintenance** regarding access and fueling; **Prescribed Fire** regarding fire and camping.

ACTIVITY COMPONENTS AND WORK ELEMENTS

Biological Control

Biological methods require the use of living organisms to selectively suppress, inhibit, or control herbaceous and woody vegetation. This method requires the proper management of plant-eating organisms and precludes the use of mechanical devices, chemical treatments, or burning of undesired vegetation. Biological weed control activities typically include release of parasitic and "host specific" insects to target weeds. Presently, insects are the primary biological control agent in use. Mites, nematodes, and pathogens are occasionally used. Treatments do not eradicate the target species but rather reduce target plant densities and competition with desired plant species for space, water, and nutrients. Bio-control agents are typically used where the target weed has dominated the plant community across large areas.

Collection / Release of Insects or Other Biological Controls – Biological control activities include collection of insects, development of colonies for collection, transplanting parasitic insects, and supplemental stocking of populations. In most situations, a complex of biological control agents is needed to reduce weed density to a desirable level. For example, a mixture of five or more biological control agents may be needed to attack flower or seed heads, foliage, stems, crowns and roots all at the same time or during the plant's life cycle. Typically 15 to 20 years are needed to bring about an economic control level.

Monitoring by Sweep Netting – This involves inventory and monitoring of released bio-control agents to determine treatment success. Repeat visits may need to be made several times a season, and over a series of years.

Competitive Seeding - Noxious weeds commonly invade areas with disturbed or exposed soil or areas where native plants cannot compete with aggressive exotic plants. Consequently, after control of weeds, it is beneficial to establish native/desirable plants, restrict or prevent additional infestations, and help prevent soil erosion and soil nutrient loss. Treatments may require ground and/or aerial application of seeds and fertilizers.

Transport of Bio-control Agent by Vehicle – Bio-control agents are transported in containers that safely enclose the agent until release.

Cultural Control

Cultural control treatments require management changes associated with prevention, livestock or wildlife habitat manipulation, competitive plantings, and a change of public land use.

Chaining - Chaining is used to remove and or destroy vegetation. Chain-dikers have disks welded to the links of an anchor chain. This is pulled behind a crawler tractor and as the chain rotates it improves tillage, land smoothing and basin formation, in a single pass. This is the most effective method for preparing seedbeds on sites with relatively large amounts of brush and other woody debris.

Provide Shade - Shade (i.e. shade cards or mulch) may be necessary to protect seeds and seedlings from high solar rays. GO TO **Reforestation Activity Type, Artificial Shade Activity Component, Shade Cards Work Element** for the description of this Work Element.

Fertilize by Hand, Machine, or Aerial – Fertilizer application by aerial or ground method depending on the sites locations and treatment objectives. For hand application of fertilizer, also see **Insect and Disease Suppression Activity Type, Fertilization Activity Component, Hand application of N frells Work Element** for additional information.

Injection/Cut Stump – Herbicides may be injected into stumps, using a hatchet injector or other type of instrument to inhibit re-sprouting.

Grubbing – GO TO **Reforestation Activity Type, Site preparation Activity Component, Hand scalp/grubbing Work Element** for the description of this Work Element.

Prescribed Fire – Fire removes the woody debris and herbaceous litter that interferes with seedbed preparation. The effectiveness of using fire to remove debris varies with environmental conditions and the amount and distribution of fuel. GO TO **Prescribed Fire Activity Type** for work elements that describe this activity.

Use Grazing to Control Weeds, Fencing, or Herding – Domestic animals such as sheep or goats can be a valuable control method at reduced costs. The following considerations will be made before using livestock or herding: 1) size of infestation, 2) plant species, 3) timing of consumption for best control, 4) availability of water sources for stock, 5) stock management to insure beneficial effects, (e.g., when stock presence does not encourage spread of noxious weeds

into non-infested areas). Some combinations of livestock or other bio-control agents such as insects may be the most effective.

Plant Native Vegetation – Planting native vegetation in areas following fire will help prevent invasion and spread of noxious weeds. In areas where a good establishment of native species exists prior to fire, there is a high probability that natives would re-establish and occupy the site. In certain habitats, native species lower the frequency, intensity, and occurrence of wildland fire. **GO TO Reforestation Activity Type, Hand plant upland/riparian Activity Component, Plant trees and shrubs with hoe, bar, auger Work Element** for a description of planting trees and shrubs. **GO TO Range Infrastructure Activity Type, Rangeland Restoration Activity Component** for Work Elements that describe seeding activities.

On and Off Road Vehicle Use – **GO TO Access and Equipment Maintenance Activity Type, Access to Work Site Activity Component** for work elements that describe this activity.

Mulch – By Hand or Machine –Applying mulch helps prevent soil erosion, retain soil moisture, and protect seeds and seedlings from extreme temperature changes, wind, or damage from trampling. Mulch can be applied by manual or mechanical means depending on the need. Mulch may be applied using mulch mats, shovels, and rakes. Within the **Watershed Restorations Activity Type**, see **Hillslope Erosion Control Activity Component, Erosion control mulch or blankets Work Element**, and **Re-vegetation Activity Component, Mulch Application Work Element** for additional information.

Herbicide Control

The herbicide application method and selected technique depends on a number of variables such as treatment objective (contain versus eradicate), accessibility, topography, and size of treatment area, characteristics of target plant and desired vegetation, location of sensitive areas in immediate vicinity, anticipated costs and equipment limitations, and meteorological and vegetative conditions at time of treatment.

Applications are scheduled and designed to minimize potential impacts to non-target plants and animals, while remaining consistent with vegetation treatment program objectives. Application rates depend on the presence of the target species, condition of non-target vegetation, soil type, depth to the water table, and distance to open water sources, riparian areas, special status plants, and requirements of the herbicide label. See the **Insect and Disease Suppression Activity Type** for additional chemical application descriptions.

Hand Crank Granular Spreader – Some herbicides are applied in solid form and are placed on the soil surface to be absorbed by plant roots.

Liquid Application - Carriers (gases, solids, or liquids) are used to dilute or suspend herbicides during application and allow for proper herbicide placement. Liquid carriers include water, liquid fertilizers, diesel, and other similar low-viscosity oils. Water is the most widely used carrier because it is available, cheap, and most herbicides are formulated to be applied with water.

Spray solution additives, adjuvant, are mixed with herbicide solutions to improve spray mixture performance. Adjuvant can either enhance activity of a herbicide's active ingredient or offset any problems associated with spray application such as adverse water quality or wind. Adjuvant may contain surfactants, antifoaming agents, crop oil or crop oil concentrates, drift retardants, compatibility agents (mixing two or more herbicides in a common solution), and spray buffers (change the spray solution PH).

Spray from ATV – A sprayer attached to an ATV allows for treatments of patches of weeds on hillsides, or other areas not easily accessible by road.

Granular Application – Some herbicides are applied in solid form and are placed on the soil surface to be absorbed by plant roots.

Back Pack Sprayer with Spray Wand – The use of pressurized container with an agitation device carried with backpacking equipment, allows the operator to target specific or individual plants.

Aerial Application by Fixed Wing or Helicopter – Aerial application of herbicides from a helicopter or fixed wing aircraft do not disturb soil or protective organic layers and are not limited by inaccessibility or rugged terrain. Applications allow for treatment of large areas quickly with a smaller workforce. However, drift management and off-site effects may be more difficult to manage and predict.

Spray from Truck Mounted Boom or Spray – Truck mounted mechanical spray equipment is primarily limited to treatment of accessible roadsides and flat areas. This allows large area coverage, and is faster and less expensive than manual or hand applications.

Hand Controlled Wand with Soaked Wick – This technique allows user to target individual unwanted plants reducing risk to non-target organisms and other resources.

Manual Control

Manually treating noxious weeds may disturb soil surfaces and can be labor intensive and costly when compared to herbicide applications. Manual treatments are typically used to treat selected plants, small infestations, and in sensitive areas to avoid adverse effects to non-target species or water quality.

Hand Clip Seed Heads or Pull Weeds - Crews may use power or hand tools to cut, clear or prune vegetation; pull, grub, or dig out plant root systems to prevent subsequent sprouting and re-growth; scalp vegetation at ground level or remove competing plants around desired vegetation; or place mulch around desired vegetation to limit the growth of competing vegetation. All noxious weed disposals will be in accord with proper disposal methods. Noxious weeds with developed flowers are generally bagged and burned. This method is most effective on new infestations of annual, biennial, or simple perennial exotic plant species.

Handsaws, axes, shovel, rakes, machetes, grubbing hoes, mattocks, brush hooks, and hand clippers may all be used to treat weeds. Axes, shovels, grubbing hoes, and mattocks are also used to dig up and cut below the surface to remove the main root of plants. This is especially effective on plants that quickly re-sprout in response cutting and clearing.

Mechanical Control/Restoration

Activities include the use of wheel tractors, crawler-type tractors, or specially designed vehicles with attached implements for mechanical vegetation treatments (e.g., plows, harrows, rangeland drills and mowers). Choosing the appropriate treatment depends on the characteristics of undesired species present (for example, density, stem size, brittleness, and sprouting ability); the need for seedbed preparation and revegetation; topography and soil characteristics of the site (e.g., type, depth, amount and size of rocks, erosive conditions, and susceptibility to compaction). It also depends on climatic conditions and potential cost of improvement as compared to expected productivity. Activities typically occur on old agricultural areas, industrial sites, and roadsides.

Weed-Whacker Use – This is a motorized brush cutter with a saw-like blade used to remove herbaceous or woody plant materials. This may be used in conjunction with other power tools to (such as a brush buster), to remove noxious weeds or clear dense areas of trees or brush preparing the area for replanting or reseeding. Slash busters may be used to mow down heavy slash or unwanted vegetation in densely vegetated areas.

Plowing – transport of heavy equipment – Tractors with attached discs (disking), chains (chaining) or other types of plows may be used to clear and de-root plants, furrow (plowing a strip) or contour a site, or completely remove vegetation (scarification) from an area. The transport of tractors and their associated implements may require the use of trucks with low bed trailers or other types hauling vehicles.

Mowing of Weeds – Tractors with mowing implements may be used to mow vegetation along roadsides, and in rangelands with dense shrubs or grasses. Although mowing may not remove roots, it helps eliminate undesired plant species by giving desired plants a competitive advantage. For mowing in Sage Brush, GO TO **Prescribed Fire Activity Type, Sage Brush Activity Component(s)**, *Mowing/Brushbeating Work Element* for a description of this activity. For all other mowing, GO TO **Threatened, Endangered Species Habitat Restoration Activity Type, Meadow Restoration Activity Component**, *Mowing Work Element* for a description of this activity.

Drill Seeding - On areas with moderate slopes, the use of rangeland drills attached to tractors, may be the most effective method reseed an area.

Aerial Application of Seed – Seed may be applied aerially using helicopters or fixed wing aircraft when appropriate. GO TO **Range Infrastructure Activity Type, Rangeland Restoration Activity Component**, *Seeding - aerial Work Element* for the description of this Work Element.

Weed Prevention

Wash Vehicles, Water Drafting - Washing vehicles used to access and maneuver around treatment sites should occur before and after work is accomplished. Washing would occur at designated areas and may require water drafting from a nearby water source such as a pond, lake, stream, or spring. Water hauled in by truck is an alternative to using natural water sources. Within the **Prescribed Fire Activity Type, Fireline Construction/Holding Actions Activity Component**, see the *Pumping from streams/ponds using portable pumps* and *Drafting to fill engines/tenders Work Elements* for additional information.

Information

Education/Outreach – Informational materials, seminars, and workshops may be provided to assist agency personnel and the public in understanding the effects of noxious weed invasion. Providing information and education to assist with prevention, control, and eradication of noxious weeds is the primary objective of these efforts.

Federal land management agencies that conduct noxious weed treatments must closely coordinate with federal and state agencies, county weed control programs. Herbicides used on federal lands must be registered by the U.S. Environmental Protection Agency.

References

A Risk Assessment for Herbicide Use: A USDA Forest Service Publication of Forest Service Regions 1, 2, 3, 4, and 10, and the Bonneville Power Administration (1992). This has been prepared to address applicable risks of herbicides to human health and non-target species including wildlife and aquatic species.

Noxious Weeds Home Page at www.fs.fed.us/r6/weeds: A USFS Region 6 Natural Resource Home Page. This is an excellent resource with detailed information about noxious weeds, treatments, chemical uses, and the legal aspects treatments related to chemicals uses.

ATTACHMENT 1 RIPARIAN AREA LITERATURE SUMMARY – Including RHCAs

INTRODUCTION

“RHCA” (Riparian Habitat Conservation Area), as used in the Conditional Statement is defined in PACFISH (1995) and INFISH (1995): It is similar to “riparian reserve” used in the Northwest Forest Plan, and RCA used in the draft ICBEMP EIS.

“Riparian Habitat Conservation Areas are portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. Riparian Habitat Conservation Areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1). Influencing the delivery of coarse sediment, organic matter, and woody debris to streams, 2). Providing root strength for channel stability, 3). Shading the stream, and 4) protecting water quality” (Naiman et al. 1992).

Further, RHCA extent is described in PACFISH/INFISH as follows:

“Widths of interim Riparian Habitat Conservation Areas that are adequate to protect streams from non-channelized sediment inputs should be sufficient to provide other riparian functions, including delivery of organic matter and woody debris, stream shading, and bank stability” (Brazier and Brown 1973; Gregory et al. 1987; Steinblums et al. 1984; Beschta et al. 1987; McDade et al. 1990; Sedell and Beschta 1991; Belt et al. 1992).

The value and function of riparian vegetation are discussed in The Interior Columbia Basin Science Assessment (Quigley et al. 1997):

“Ecological functions provided by riparian vegetation are achieved at different distances, depending on the type of function and the width of riparian vegetation needed for the function. “ Examples:

Litter fall and nutrient input and retention in streams (23 to 46 meters), shade to streams for maintenance of summer stream temperatures (23 to 46 meters), woody debris delivery (30 to 46 meters), stream bank stability (8 to 12 meters), and sediment buffering (100 to 170 meters depending on slope and lithology adjacent to the stream).

Watershed or stream-specific analysis should be used as the basis for defining local buffer widths needed to prevent inputs of fine sediment. Based on the Science

Assessment, in the absence of local watershed analysis, RHCA buffers adequate to prevent delivery of non-channelized sediment, to both perennial and intermittent streams, should be according to the following (Quigley et al. 1997 - based on the 5% Exceedance probability – see Figure 4.26).

Table 1. RHCA buffer widths necessary to avoid delivery of non-channelized sediment to streams by slope gradient.

<u>Slope (%)</u>	<u>RHCA buffer width(ft)</u>
<5	115
6-10	165
11-15	210
16-20	250
21-25	300
26-30	325
31-40	350
41-50	400
51-60	430
>60	450

RHCA Widths:

RHCA widths are defined for fish-bearing streams, permanently flowing non-fish bearing streams, ponds/lakes/reservoirs greater than 1 acre in size, wetlands, intermittent streams, landslides, and landslide-prone areas. See PACFISH (page C8-C9) or INFISH (page E5-E6) for specific definitions of RHCA widths.

OVERVIEW

The following was excerpted from: Quigley, T. M.; S.J. Arbelbide, tech. eds. 1997. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 vol. (Quigley, T. M., tech. ed.; The Interior Columbia Basin Ecosystem Management Project: Scientific Assessment), Volume 3, pp 1365-1369.

Riparian Area Management—Four biophysical principles underlie any evaluation of a riparian management strategy: 1) a stream requires predictable and near-natural energy and nutrient inputs; 2) many plant and animal communities rely on streamside forests and vegetation; 3) small streams are generally more affected by hill-slope activities than are larger streams; and 4) as adjacent slopes become steeper, the likelihood of disturbance resulting in discernable in-stream effects increases.

Importance of Energy Inputs to Streams—First, stream and riparian organisms need energy (leaves, wood, organic carbon) and nutritional inputs to sustain their biological functions. An understanding of the influence of riparian vegetation on streams is fundamental to understanding

the function and effectiveness of RHCAs. Streams are intricately connected physically, chemically, and biologically to their riparian zones (Murphy and Meehan 1991; Naiman et al. 1992; Gregory et al. 1991). Roots of streamside vegetation stabilize banks, retard erosion, and affect nutrients in groundwater. Root systems, in combination with large woody debris, provide channel roughness elements that not only promote sediment storage but encourage the hydraulic exchange of streamflow and subsurface flows. Vegetation and downed woody debris dissipate stream energy during floods and obstruct movement of sediment and organic matter (Sedell and Bestcha 1991). The combination creates very complex habitats for aquatic organisms. The canopy provides leaves and other organic materials that are part of the energy base for the stream ecosystem, and its shade limits algal production and moderates stream temperature. Trees that fall into the stream provide the principal structural features that shape the stream's morphology, linkages to the floodplain, habitat complexity, streambed materials, and other characteristics (Salo and Cundy 1987; Meehan 1991; Naiman 1992).

Protection for Riparian Dependent Plants and Animals -Second, some terrestrial and semi-aquatic plant and animal communities rely on the forest and shrubs adjacent to streams (Terrestrial Ecology, Chapter 5). Animals such as beavers, otters, dipper, and some amphibians are obligate stream and riparian vegetation dependent organisms. Other bird and mammal species and many bat species need the riparian management area at crucial life history periods or seasonally for feeding or breeding. Wildlife has a disproportionately high use of riparian areas and streamside forests compared with the overall landscape. RHCAs provide habitat needs such as water; cover; food; plant community structure, composition, and diversity; increased humidity; high edge-to-area ratios; and migration routes (Carlson 1991; O'Connell et al. 1993). The Washington Department of Wildlife (1992) recommended wetland buffer widths for protection of wildlife species in the state. Roderick and Milner (1991) also prescribe wildlife protection buffer requirements for wet-lands and riparian habitats in Washington. These widths vary from 30 to 183 meters depending on species and habitat usage (FEMAT 1993). The variable widths of riparian areas suggest a one-size-fits-all approach will not accommodate all organisms. Hence the community ecology functions of RHCAs will need to be determined both at the site and throughout a subbasin if the organism is wide ranging.

Importance of Small Streams—Third, small streams are more affected by hill slope activities than are larger streams because there are more smaller than larger streams within watersheds, smaller channels respond more quickly to changes in hydrologic and sediment regimes, and stream-side vegetation is a more dominant factor in terms of woody debris inputs and leaf litter and shading. Small perennial and intermittent non-fish bearing streams are especially important in routing water, sediment, and nutrients to downstream fish habitats (Reid and Ziemer 1994). Intermittent streams account for more than one-half the total channel length in many watersheds in the Basin and therefore strongly influence the input of materials to the rest of the channel system. Channelized flow from intermittent and small streams into fish bearing streams is a primary source of sediment in mountainous regions (Belt et al. 1992). In steep, highly dissected areas, intermittent streams can move large amounts of sediment hundreds of meters, though buffer strips, and into fish bearing streams. In-channel sediment flows are limited primarily by the amount and frequency of flow and by the storage capacity of the channel. Flows in forested, intermittent streams are generally insufficient to move the average sized wood piece, allowing large wood to accumulate in small channels (Bisson and others 1987). These accumulations increase the channel storage capacity and reduce the likelihood of normal flows moving sediment downstream. Large Woody Debris

(LWD) east of the Cascade Crest is defined as pieces of wood: “>12 inch diameter and > 35 feet in length”. West of the Cascade Crest, LWD is defined as: “>24 in diameter and > 50 feet in length’.

Live vegetation plays an important role in stabilizing granitic colluvium that accumulates in small headwater basins of the Idaho batholith. Typically, these draws or hollows show little evidence of surface flow and contain deep (several meters), unconsolidated granitic colluvium. Periodically these sites are rejuvenated by floods that flush some or most of the material until another period of relative stability results in accumulation of colluvium and filling (Gray and Megahan 1981; Megahan and others 1995). Gray (1970, 1978) identified four mechanisms by which vegetation enhances soil stability including: 1). mechanical reinforcement by roots; 2) regulation of soil moisture content; 3) buttressing between trunks or stems of plants; and 4) surcharge from the weight of trees. Gray and Megahan (1981) evaluated these hydromechanical effects in the batholith and found that the first three are highly important in stabilizing slopes, hollows, and intermittent streams. Gray and Megahan (1981) recommended using buffer zones along the margins of streams and in critical areas such as hollows and intermittent streams. The direct influence of riparian vegetation on stream and animal and plant community declines with increasing distance from the channel and with the height of the dominant tree species (FEMAT 1993). Ecological functions provided by riparian vegetation are achieved at different distances, depending on the type of function and the width of riparian vegetation needed for the function.

The maximum height of dominant trees influences the potential distance over which riparian vegetation directly affects stream channels. For instance, tall trees potentially contribute shade, particulate organic matter, and large woody debris at greater distances from streams than do short trees. Areas capable of producing large tall trees thus possess wider functional riparian zones than areas in which trees do not grow as large. For this reason, FEMAT (1993), PACFISH (1995), and INFISH (1995) used the height of dominant late-successional tree species that would naturally grow in a particular riparian zone as the basis for reconnecting streamside buffers needed to safeguard ecological functions instead of suggesting a fixed “onesize-fits-all” linear distance. Use of a fixed distance from the streambank to the outer margin of the buffer strip would not allow for differences in potential tree growth between regions. PACFISH (1995) prescribed 90 meter minimum RHCA widths for fish bearing streams to maintain stream function from sediment inputs from non-channelized sources. A review of the literature indicates that this should also be sufficient to provide for other riparian functions with a margin for error (Gregory and others 1987, Beschta et al. 1987, Brazier and Brown 1973, Steinblums et al. 1984, McDade et al. 1990, Sedell and Beschta 1991, Belt et al. 1992). These functions include litterfall and nutrient input and retention in streams (23 to 46 meters), shade to streams for maintenance of summer stream temperatures (23 to 46 meters), woody debris delivery (30 to 46 meters), and stream bank stability (23 to 46 meters). RHCA widths for intermittent streams should protect small channels from large volumes of sediment and water that could be generated by land management activities and be channeled into fish bearing streams. The effectiveness of riparian buffer strips in influencing sediment delivery from non-channelized flows is quite variable. Belt and others (1992), cited numerous studies conducted throughout the range of anadromous salmonids and reported that sediment travel-distances and filter strip efficiencies varied considerably from study to study. Belt et al. (1992) concluded, based on studies conducted in Idaho (Haupt 1959a and 1959b, Ketcheson and Megahan 1990, Burroughs and King

1985 and 1989) and elsewhere (Trimble and Sartz 1957, Packer 1967, Swift 1986) that sediment rarely travels more than about 91 meters for non-channelized flow. Therefore, 91-meter filter strips are generally effective in controlling sediment that is not channelized. Trimble and Sartz 1957, recommended that where the highest possible water quality standard was required, this could be maintained with 100 meter buffer strips on 70 percent slopes. Recent work by Ketcheson and Megahan (1996) indicates that this may not be adequate on some lithologies and slopes.

Importance of Hill Slope Steepness—Fourth, the likelihood of disturbance resulting in discernible in-stream effects increases as adjacent slopes become steeper. Thus, greater preventive measures to avert or rehabilitate riparian function and structure on steeper slopes may be required to prevent or reduce in-stream effects. The designation of default RHCA widths can easily incorporate the major topographic driver of surface erosion and slope steepness.

Prior research on a variety of wildland and agricultural settings has demonstrated that surface erosion increases with increasing slope steepness, although the increase is not linear. The effect of slope has generally been modeled empirically, and has taken the shape of a power function where the exponent is less than 1, so that slope effects are large for gentle slopes, and decline as slopes get steeper (Foster 1982; Liebenow and others 1990; McCool and others 1987). Megahan and Ketcheson (1996) found that sediment travel distances from road cross drains in the Idaho batholith are proportional to slope gradient (in percent) raised to the 0.5 power. This study was conducted below roads on forested lands, and includes slope gradients ranging from 9 to 59 percent. Megahan and Ketcheson (1996) and Ketcheson and Megahan (1996) present equations for estimating sediment travel distance below road fills and cross drains which incorporate sediment volume, obstructions, slope angle, and source area as significant explanatory variables. Slope is a significant predictor of distance, and it is not unreasonable to adjust an RHCA width to slope when lacking other intensive site variable information. At slopes greater than 70 percent, other screening tools that incorporate mass erosion risk are needed (Tang and Montgomery 1995). If risk varied solely as a function of slope, one could use the exceedence probability equation directly to tune a slope-directed RHCA model. However, at least three other site variables have been demonstrated to influence travel distance and therefore affect risk. Though it is erroneous to assume that the exceedence probability equations presented by Ketcheson and Megahan (1996) can be used to assign a general slope-driven risk to the RHCA width equation, at the subbasin scale a slope-driven default RHCA width is useful. It is also prudent to use for watershed analysis and planning at the subbasin and Forest project scales. The research findings of Megahan and Ketcheson (1996) can be used to parameterize a slope-sensitive default RHCA width in the following manner: Distance can be made proportional to slope angle in percent raised to the 0.5 power to provide the proper shape. A constant can be derived from the exceedence probability function of Ketcheson and Megahan (1996) by taking the travel distance that is exceeded only one time in 20 (exceedence $p=0.05$), a low probability event from their data. The travel distance of this event for all their data combined is 480 feet. This distance can then be assigned to a slope of 70 percent, which results in the equation $\text{Distance} = 58 \times (\text{Slope})^{0.5}$ (fig. 4.26). Although this equation is adjusted to the 5 percent travel distance event, it is not strictly correct to assume that the relationship defines the 5 percent risk associated with operating on slopes of a given steepness. Similarly, equations and curves that represent “10%” and “25%” risk can be derived by using the 10 percent and 25 percent probability of exceedence distance from Ketcheson and Megahan (1996; fig. 4.26). For the same reasons stated above, these equations do not directly represent 10 and 25 percent risk. They are less conservative than the 5 percent risk equation, but not necessarily by a factor of 2 and 5. The strongest single variable affecting sediment travel distance from soil disturbing activities is the volume of material displaced, or delivered to a point on a slope from a culvert, drain, etc. Over 78 percent of the variance in sediment travel distance is explained by volume in the culvert model of Megahan and Ketcheson (1996). Given the strong

influence of this relationship, the probability density function of sediment volumes from the data set used in developing their model can be used to define various levels of risk. This is a subtle difference from defining risk using the probability exceedence function (equation 4 of Ketcheson and Megahan 1996) as above, because risk is attributable to a single, measurable attribute — sediment volume. In contrast, the probability exceedence function for travel distance includes the combined effects of all driving variables. Defining risk by volume alone allows a direct application of the Megahan-Ketcheson model for tuning travel distance on slope.

This method assumes that travel distance is strongly influenced by slope in the culvert model. We tested this by regressing the residuals of a 3-variable model [Distance = f (volume, source area, obstacles) on slope]. This regression is significant at $P=0.001$ and has an $r^2=0.33$, indicating that there is ample variance to be explained by slope gradient after accounting for the other variables in the multiple model. A slope-gradient sensitive default RHCA can be estimated directly by setting the two variables “obstacles” and “source area” equal to their median values, allowing slope gradient to vary from 0 to 70 percent, and assigning risk by taking various volumes based on the distribution of volumes sampled in the Megahan-Ketcheson data set. The following reconfiguration of the culvert model was used to generate the curves in fig. 4.27:

$$D = 3.28 \bullet 10^{(0.393 + 0.554 \times \log_{10} \text{Vol} + 0.5 \times \log_{10} \text{Slope})}$$

The variable $\log_{10} \text{Vol}$ was set equal to 1.60, 1.57, and 1.41 corresponding to the 95, 90, and 75 percentile values of sediment volume sampled; median values of obstructions and source area were used and slope was allowed to vary from 0 to 70. This procedure results in a series of three curves that are similar, but somewhat more conservative than the curves based on the travel distance exceedence curve of Ketcheson and Megahan (1996).

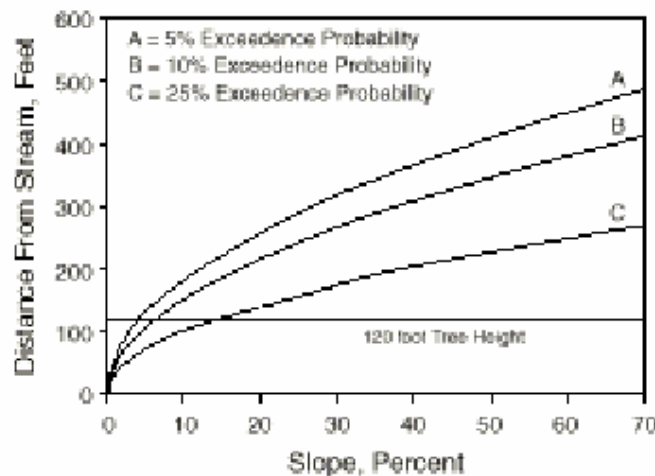


Figure 4.26. Examples of slope sensitive adjustments to RHCA widths with associated probabilities of exceedence (.05, 0.10, and 0.25) based on model described by Megahan and Ketcheson (1996) and Ketcheson and Megahan (1996). (A). Distance = $58 \bullet (\text{slope})^{0.5}$ (B). Distance = $49 \bullet (\text{slope})^{0.5}$ (C). Distance = $32 \bullet (\text{slope})^{0.5}$

Again, the utility of this second set of curves is that risk is defined from the single, strongly influential variable of volume, and the effect of slope is then predicted directly using the Megahan-Ketcheson model.

The width necessary to protect stream and riparian area structure and function can be determined from watershed and site-specific analysis. The dimensions of riparian protection areas, particularly if they are to be used as interim or default standards, should also include safety factors to allow for natural disturbances, uncertainties about the riparian ecosystem of interest, and changes in public values (National Research Council 1996). If an additional margin of error is allowed (not unlike bridge design accounting for unknown factors and longevity of structure), the probability of habitat improvement becomes greater and options for future management decisions are increased (FEMAT 1993). In general, buffer widths prescribed in FEMAT (1993) and reexamined by Murphy (1995) and Spence and others (1995) are applicable to detecting ecological functions whether streams contain fish or not (National Research Council 1996). In contrast, all national forest plans, PACFISH, and INFISH maintain a higher level of riparian protection where fish are present or strongly affected than for non-fish bearing streams.

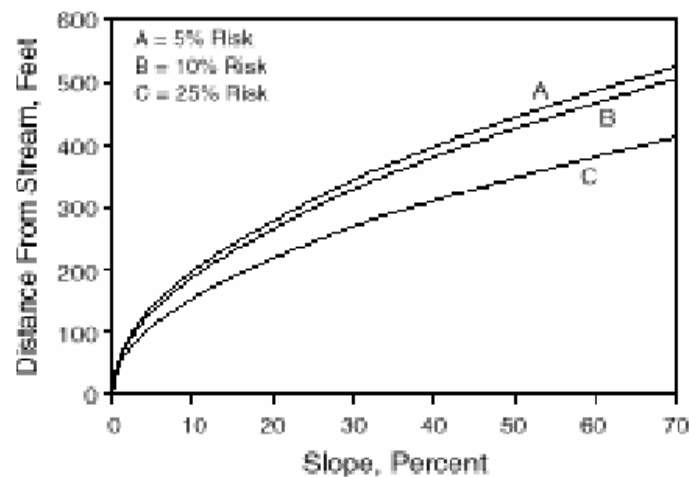


Figure 4.27. Examples of volume-driven risk associated with adjustments to RHCA widths based on models developed and sediment volume sampled by Megahan and Ketcheson (1996) and Ketcheson and Megahan (1996).

Information and Literature References Used to Develop Criteria for National Fire Plan Activities Effects on Salmonids

From the FEMAT Report Page V-26

Riparian Processes as a Function of Distance from Stream Channels

Root Strength: To maintain channel integrity

“Root strength provided by trees and shrubs contribute to slope stability; and the loss of root strength following tree death by timber harvest or other causes may lead to increased incidence of debris slides and flows (Sidle et al. 1985). The soil stabilizing zone of influence for vegetation in these sites is the slide scar width plus half a tree crown diameter (fig. V-12). Half a tree crown diameter is an estimate of the extent to which root systems of trees adjacent to the slide scar margin affect soil stability. The contribution of root strength to maintaining streambank integrity also declines at distances greater than one-half a crown diameter (Burroghs and Thomas 1977; Wu 1986; and personal communication F.J. Swanson and T. Spies, Pacific Northwest Research Station, Corvallis, Oregon).

Shade/Temperature (excluding microclimate)

“Effectiveness of streamside forest to provide shade varies with topography, channel orientation, extent of canopy opening above the channel, and forest structure, particularly the extent of both under- and overstory. Although any curve depicting this function is by necessity quite generalized (fig. V-12), buffer width correlates well with degree of shade (Beschta et al. 1987). In the Oregon Coast Range and western Cascade Mountains riparian buffers of 100 feet or more have been reported to provide as much shade as undisturbed late successional/ old-growth forests (Steinblums 1977).

Water Quality

Castelle et al. (1992) provide a thorough literature review of widths of riparian areas required to protect water quality functions. In general, the authors found that widths of riparian areas required to protect water quality ranged from 12-860 feet. Widths varied as a function of geomorphic characteristics such as slope and soil type and by vegetative structure and cover. Effectiveness of buffers at improving water quality adjacent to logging operations was studied by Broderson (1973), Darling et al. (1982), Lynch et al. (1985), and Corbett and Lynch (1985). Broderson studied three watersheds in western Washington and found that 200 foot buffers, or about one site-potential tree height, would be effective to remove sediment in most situations if the buffer were measured from the edge of the floodplain.

Large wood delivery to streams

“ The probability that a falling tree will enter the stream is a function of slope distance from the channel in relation to tree height (VanSickle and Gregory 1990; McDade et al. 1990; Andrus and Lorenzen 1992; Beschta et al. 1993). The effectiveness of floodplain riparian forests and riparian forests along constrained channels to deliver large wood is low at distances greater than approximately one tree height away from the channel (fig. V-12).”

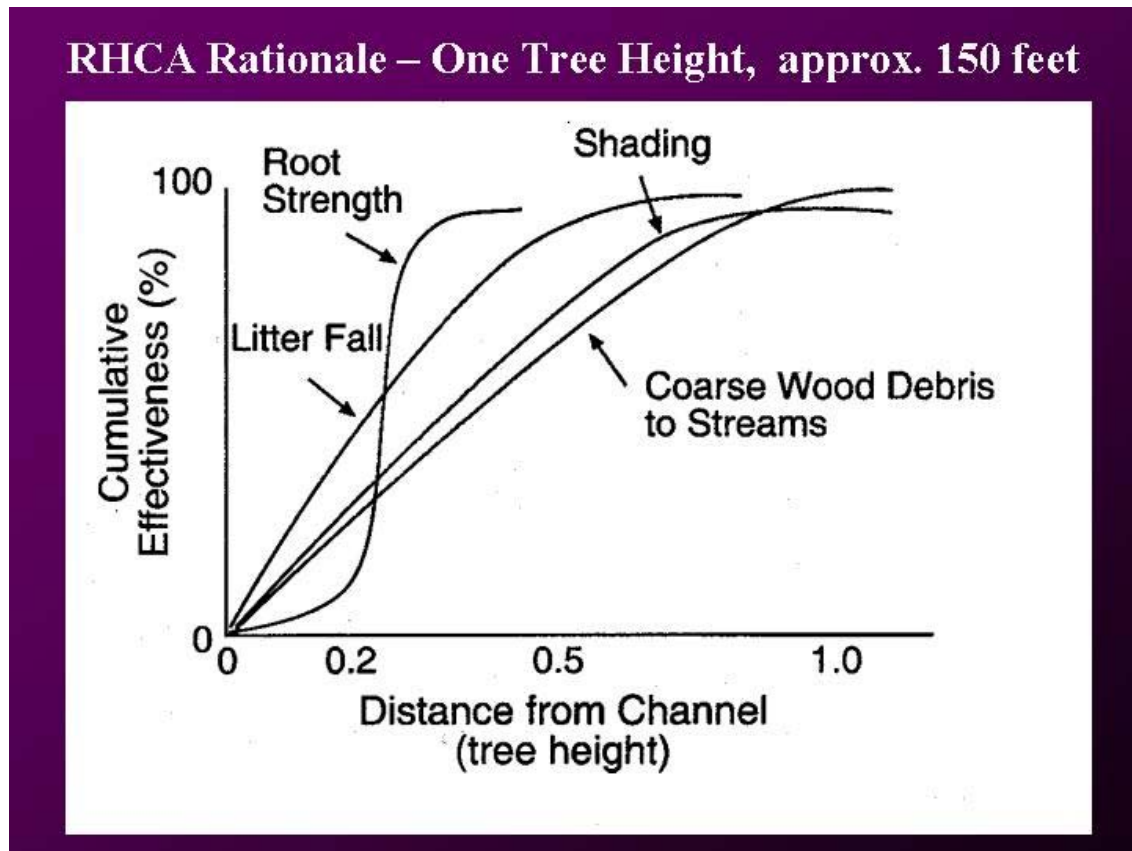


Figure V-12 from FEMAT (page V-27).

Buffer components that affect erosion rates

Pannkuk, C.D., Robichaud, P.R., and R.E. Brown. 2000. Effectiveness of needle cast from burnt conifer trees on reducing erosion. Proceedings, 2000 A.S.A.E. Annual International Meeting, Paper Number 005018, July 9-12, 2000, Milwaukee, WI. ASAE St. Joseph, MI.

“Surface cover affects soil erosion by decreasing the area susceptible to raindrop impact as well as reducing transport of runoff (Foster 1982), and by causing deposition in ponded areas (Laflen, 1983). In current erosion models such as the Revised Universal Soil Loss Equation (RUSLE) (Renard et al. 1997) or the Water Erosion Prediction Project (WEPP), cover is the most important factor in controlling erosion.”

ATTACHMENT 2

EFFECTS REFERENCES

References for the “Potential Effects”, “Criteria”, and “Rationale” in the Salmonids Criteria (June, 2001).

EROSION: Long-term effects of fire usually result from erosion. Erosional processes potentially change channel morphology, sediment composition and concentration, food availability, and recruitment and distribution of large woody debris (Minshall and others 1990).

Revegetation of burned areas is influenced by the intensity and duration of a fire (Knight 1987), and the amount and type of new vegetation are related to changes in water yield and nutrient retention in the watershed. Erosional effects of fire generally peak within 10 years following the event (Brown 1989).

NUTRIENTS: Eutrophication is indicative of deteriorating water quality associated with a buildup of nutrients, especially nitrogen and phosphorus. Increased rates of nutrient loading can be related to changes and/or disturbances within a watershed (Brugam and Vallarino 1989; Dojlido and Best 1993; Stauffer 1991). Development activities that contribute to increased nutrient levels include point sources such as industrial effluents and water-borne sewage systems and nonpoint sources such as agricultural operations, residential development and septic systems, road construction, and forest practices. (Dojlido and Best 1993; Spencer 1991; Thralls 1991).

LIVESTOCK GRAZING: Riparian areas maintain stream structure and function through processes such as water filtration, bank stabilization, water storage, groundwater recharge, nutrient retention, regulation of light and temperature, channel shape and pattern (morphology and micro-topography), and dispersal of plants and animals (Cummins et al. 1984; Gregory et al. 1991; Minshall 1967, 1994; Sullivan et al. 1987). Because of the availability of water, forage, and thermal cover, riparian areas are often overgrazed by livestock. Livestock grazing can alter the species composition of stream-side vegetation (Archer and Smeins 1991; Platts 1978; Stebbins 1981; Thurow 1991; Vollmer and Kozel 1993) and diminish vegetative productivity (Archer and Smeins 1991; 1994; Meehan and Platts 1978; Platts 1978; Thurow 1991; Vollmer and Kozel 1993). Grazing alters riparian vegetation by removing deep root-ing plant species and decreasing canopy cover and riparian vegetation height (Platts 1991). Grazing has been implicated in the alteration of species composition of vegetative communities and associated fire regimes (Agee 1993; Leopold 1924). Grazing is a major nonpoint source of channel sedimentation (Dunne and Leopold 1978; MacDonald et al. 1991; Meehan 1991; Platts 1991).

SEDIMENTATION: Sediment loads that exceed natural background levels can fill pools, silt spawning gravels, decrease channel stability, modify channel morphology, and reduce survival of emerging salmon fry (Burton et al. 1993; Everest et al. 1987; MacDonald et al. 1991; Meehan 1991; Rhodes et al. 1994).

As the deposition of fine sediments in salmonid spawning habitat increases, mortality of embryos, alevins, and fry rises. Erosion potential is greatly increased by reduction in vegetation, compaction of soils, and disruption of natural surface and subsurface drainage patterns (Chamberlain et al. 1991; Rhodes et al. 1994). Generally, logged slopes contribute sediment to streams based on the amount of bare compacted soils that are exposed to rainfall and runoff. Slope steepness and proximity to channels determine the rate of sediment delivery

TIMBER HARVEST: Soil and site disturbance that inevitably occur during timber harvest activities are often responsible for increased rates of erosion and sedimentation (Chamberlain et al. 1991; Forest Ecosystem Management Assessment Team FEMAT 1993; MacDonald et al. 1991; Meehan 1991; Reid 1993; Rhodes et al. 1994); modification and destruction of terrestrial and aquatic habitats (FEMAT 1993; van Kesteren 1986); changes in water quality and quantity (Bjornn and Reiser 1991; Brooks et al. 1992; Chamberlain et al. 1991; Rhodes et al. 1994); and perturbation of nutrient cycles within aquatic ecosystems (Rowe et al. 1992). Physical changes affect runoff events, bank stability, sediment supply, large woody debris retention, and energy relationships involving temperature (Li and Gregory 1995). All of these changes can eventually culminate in the loss of biodiversity within a watershed (Forest Ecosystem Management Assessment Team-FEMAT 1993; Rowe et al. 1992).

Water quality (for example, water temperature, dissolved oxygen, and nutrients) can be altered by timber harvest activities (Chamberlain et al. 1991). Stream temperature is affected by eliminating stream-side shading, disrupted subsurface flows, reduced stream flows, elevated sediments, and morphological shifts toward wider and shallower channels with fewer deep pools (Beschta et al. 1987; Chamberlain et al. 1991; Everest et al. 1987; MacDonald et al. 1991; Reid 1993; Rhodes and others 1994). Dissolved oxygen can be reduced by low stream flows, elevated temperatures, increased fine inorganic and organic materials that have infiltrated into stream gravels retarding intergravel flows (Bustard 1986; Chamberlain et al. 1991).

Any reduction in the amount of large woody debris within streams, or within the distance equal to one site-potential tree height from the stream, can reduce instream complexity (Rainville et al. 1985; Robison and Beschta 1990). Large woody debris increases the quality of pools, provides hiding cover, slow water refuges, shade, and deep water areas (Rhodes et al. 1994).

ROADS: Serious degradation of fish habitat can result from poorly planned, designed, located, constructed, or maintained roads (Furniss et al. 1991; MacDonald et al. 1991; Rhodes et al. 1994). Roads can also affect water quality through applied road chemicals and toxic spills (Furniss and others 1991; Rhodes and others 1994). The likelihood of toxic spills has increased with the large number of roads paralleling streams.

Roads directly affect natural sediment and hydrologic regimes by altering streamflow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, water quality, and riparian conditions within a watershed. For example, interruption of hill-slope drainage patterns alters the timing and magnitude of peak flows and changes base stream discharge (Furniss et al. 1991; Harr et al. 1975) and sub-surface flows (Furniss et al. 1991; Megahan 1972).

Road/stream crossings can also be a major source of sediment to streams resulting from channel fill around culverts and subsequent road crossing failures (Furniss et al. 1991). Plugged culverts and fill slope failures are frequent and often lead to catastrophic increases in stream channel sediment, especially on old abandoned or unmaintained roads (Weaver et al. 1987).

RECREATION/CAMPING: Where visitor use is high, trampling associated with foot traffic can affect vegetation along lakes and streams through direct mechanical action and indirectly through changes in soil (Liddle 1975). Resistance to trampling depends on plant life form; large and broad-leaved plants are most susceptible, and grasses generally are most resistant (Burden

and Randerson 1972). Loss of vegetation from shorelines, wetlands, or steep slopes can cause erosion and pollution problems (Burden and Randerson 1972; Gilliom et al. 1980).

The following was taken from: US Fish and Wildlife Service (1998)

“Mortality from incidental catch and release angling of bull trout and harvest as a result of misidentification still continues under existing fishing regulations. For example, about half or fewer of anglers surveyed were able to correctly identify bull trout from other salmonids in west-central Montana (Kelly et al. 1996; M. Long and S.P. Whalen, MFWP, *in litt.* 1997). Poaching of bull trout likely continues and can be especially detrimental to small, isolated subpopulations of migratory fish (WDFW 1992; Craig and Wissmar 1993; Pratt and Huston 1993; Long 1997). “

“According to the BA (USDA and USDI 1998a), recreation use has the potential to affect salmonid habitat by: 1) altering upland and riparian soil and vegetation conditions that may lead to increased erosion and runoff, loss of cover and food resources and reductions in water quality; and 2) instream changes that affect stream morphology, water quality, streamflow, substrate and debris. Angling as a result of recreational develop and trail maintenance and construction may lead to direct angling mortality (USDA and USDI 1998a). “

“The Service expects that recreation impacts will be most severe where dispersed or developed facilities are located in RHCAs that are non-functional. Recreation management is considered to present a moderate risk to bull trout under conditions identified above. The Service expects a low risk to bull trout where RHCAs are properly functioning and management is documented as sufficient to maintain riparian conditions.”

FERTILIZERS (Spence et al. 1996)

“Fertilizers are used in forest settings to replace nutrients lost during and after timber harvest and to accelerate growth of conifers. Application of fertilizers to a catchment typically results in increased concentrations of nutrients, particularly nitrogen, in streams. A recent review of effects of forest fertilization on water quality and aquatic biota indicates that urea application typically leads to elevated levels of urea-N, ammonia-N, and nitrate-N in surface waters (Bisson et al. 1992a). Urea-N usually dissipates within a few days, whereas ammonia-N may be elevated for months and nitrate-N for a year or more. The concentration of nitrogen within the stream depends on a number of factors, including the percentage of the watershed fertilized, the application rate, the drainage density (stream km relative to total watershed area), the width of unfertilized buffers along streams, and whether or not precipitation occurs following application. Although drinking water and aquatic standards are typically not exceeded with most applications, the elevation of nitrogen has the potential to promote growth of periphyton, which in turn may influence production of invertebrates and fishes. However, Bisson et al. (1992a) concluded that enhanced fish production because of forest fertilization has not been demonstrated in the Pacific Northwest. An indirect benefit of fertilizer applications is more rapid growth of vegetation within the catchment, which in turn accelerates the recovery of natural hydrologic regimes and sediment delivery rates. “

HERBICIDES (Spence et al. 1996)

“In forest plantations, a wide variety of herbicides are used to control the invading hardwoods, herbaceous plants, and grasses to enhance the suitability of the area for re-establishment of desired tree species. Ten herbicides commonly used in forestry are 2,4-D, picloram, hexazinone, atrazine, imazapyr, triclopyr, foramsine, glyphosate, dalapon, and dinoseb. The behavior and toxicity of these substances is reviewed in detail in Norris et al. (1991) and Beschta et al. (1995), from whom much of the information below was excerpted.”

“The risk of toxicological effects of herbicides on salmonids is greatest when herbicides are directly applied to surface waters or reach surface waters by wind drift. Whether herbicides applied to upland forests will reach surface waters depends on their volatility, mobility in the soil, and persistence in the environment. Of the herbicides commonly used in forest applications, hexazinone, atrazine, imazapyr, and triclopyr are generally the most persistent, with soil half-lives of 2-6 months or more, depending on soil type. The half-lives of most other forest herbicides are generally from 2-5 weeks. Although there is substantial literature on the toxicity of various herbicides to salmonids, most of the available information comes from laboratory studies rather than the field. These laboratory studies focus on acute lethal doses (Reid 1993). Sublethal effects of herbicides on salmonids include reduced growth, decreased reproductive success, altered behavior, and reduced resistance to stress (reviewed in Beschta et al. 1995). Sublethal exposures of picloram were found to increase mortality by 70% in yearling coho exposed to seawater (Lorz et al. 1979). Information on effects of herbicides in aquatic invertebrates is also scarce. Hartman and Scrivener (1990) reported a 42% reduction in the density of aquatic macroinvertebrates for 1.5 years following application of Roundup. These reductions were attributed to herbicide-induced irritation and drift of invertebrates coupled with high flows and decreases in substrate stability.”

“Herbicides used to release conifers from competing vegetation can accelerate the long-term recovery of upland and riparian areas. Over the short term, the elimination of deciduous vegetation can affect streams in several ways, both positive and negative. Herbicide applications in upland areas slow the recovery of vegetation, prolonging disruption to hydrologic and sediment delivery processes. Within the riparian zone, removal of deciduous vegetation increases solar radiation reaching streams, which stimulates algal production, potentially increasing the food base for invertebrates and fish. Delayed production of deciduous trees and accelerated growth of conifers reduces the delivery of leaves and intermediate-sized wood to streams over the short term, but increases the potential for recruitment of large coniferous wood over longer periods. Depending on whether temperature, spawning sites, cover, or food is limiting, these changes may initially hinder or aid salmonid production.”

INSECTICIDES (Spence et al. 1996)

“Insecticides are used both to prevent insect infestations and to control insect outbreaks once they have occurred. In general, insecticides are more toxic to fish and other aquatic biota than herbicides; however, they usually are applied at lower rates (Beschta et al. 1995). The greatest effect of insecticide on fish probably arises from effects on terrestrial and aquatic insects that form the salmonids' food base. Forest insecticides cause direct mortality to these insects or may stimulate catastrophic drift of aquatic invertebrates out of the affected stream reach. In addition, benthic algal communities in streams are frequently controlled by grazing invertebrates; consequently, the loss of invertebrates may release primary production, causing fundamental shifts in the trophic structure of streams. Norris et al. (1991) concluded that insecticides generally have shorter term effects on stream ecosystems than herbicides but that the effects may be more

dramatic. Populations of invertebrates may take months to recover following insecticide applications, and full recovery of the invertebrate assemblage may take several years (Norris et al. 1991). Because salmonids in some forest streams may be food-limited, reductions in aquatic insect biomass and altered assemblage composition may result in reduced growth and numbers of salmonids. For example, Kingsbury (1983 in Norris et al. 1991) reported a decline in the growth rate of Atlantic salmon parr immediately following treatment with an insecticide; however, by the end of summer, fish in treated and untreated reaches were of similar size. Direct toxic effects may occur if salmonids consume drifting, pesticide-laden, aquatic organisms or terrestrial insects that fall into streams. Other indirect effects of insecticides on salmonid habitats are not well documented; however, protection of trees from insect pests may reduce the number of trees that die and fall into streams, thereby reducing recruitment of large woody debris. “

FIRE RETARDANTS (Spence et al. 1996)

“The use of chemical fire retardants plays an important role in the suppression of wildfires in the west. Historically, a variety of chemicals have been used to suppress fires; however, ammonium-based retardants account for nearly all chemical retardants used today (Norris and Webb 1989). Although documentation of adverse effects of fire retardants on salmonids is scarce, quantities of retardant dropped during fires may be significant, and cases of fish mortality caused by retardants have been reported. For example, approximately 5.3 million liters of retardant were used to fight the Yellowstone fire of 1988, and at least two small fish kills (approximately 100 fish each) were reported (Schullery 1989). Fire retardant killed approximately 700 adult salmon, as well as a large number of juveniles, in an Alaskan stream (Hakala et al. 1971 in Norris and Webb 1989). Potential indirect effects of fire retardants on salmonids include mortality of invertebrates and eutrophication of downstream reaches (from phosphates). The extent of effects of retardants on aquatic ecosystems is influenced by application procedures (quantity applied, line of flight of aircraft relative to the stream), site characteristics (stream width-depth ratio, degree of canopy cover), and streamflow.”

EXTENT OF EFFECT FOR STREAM SIDE DISTURBANCES:

ROOT STRENGTH: The contribution of root strength to maintaining streambank integrity declines at one-half crown diameter distance from the streambank (Burroughs and Thomas 1977; Wu 1986; F.J. Swanson and T. Spies, Pacific Northwest Research Station, Corvallis, OR in Forest Ecosystem Management Assessment Team, FEMAT-Thomas et al. 1993). “Root strength provided by trees and shrubs contribute to slope stability; and the loss of root strength following tree death by timber harvest or other causes may lead to increased incidence of debris slides and flows (Sidle et al. 1985). The soil stabilizing zone of influence for vegetation in these sites is the slide scar width plus half a tree crown diameter (fig. V-12). Half a tree crown diameter is an estimate of the extent to which root systems of trees adjacent to the slide scar margin affect soil stability. The contribution of root strength to maintaining streambank integrity also declines at distances greater than one-half a crown diameter (Burroughs and Thomas 1977; Wu 1986; and personal communication F.J. Swanson and T. Spies, Pacific Northwest Research Station, Corvallis, Oregon).

LWD RECRUITMENT: The effectiveness of riparian forests along channels to deliver LWD is low at distances greater than one tree height away from the channel (VanSickle and Gregory 1990; McDade et al. 1990; Andrus and Lorenzen 1992; Beschta et al. 1993). “The

probability that a falling tree will enter the stream is a function of slope distance from the channel in relation to tree height. The effectiveness of floodplain riparian forests and riparian forests along constrained channels to deliver large wood is low at distances greater than approximately one tree height away from the channel (fig. V-12)."

RECRUITMENT OF DETRITUS: The effectiveness of riparian forests to provide leaf and other particulate organic matter declines at distances greater than one-half tree height away from the channel (FEMAT-Thomas et al. 1993).

SHADE: The effectiveness of riparian forests along channels to shade water surfaces is low at distances greater than one tree height away from the channel (FEMAT-Thomas et al. 1993). "Effectiveness of streamside forest to provide shade varies with topography, channel orientation, extent of canopy opening above the channel, and forest structure, particularly the extent of both under- and overstory. Although any curve depicting this function is by necessity quite generalized (fig. V-12), buffer width correlates well with degree of shade (Beschta et al. 1987). In the Oregon Coast Range and western Cascade Mountains riparian buffers of 100 feet or more have been reported to provide as much shade as undisturbed late successional/ old-growth forests (Steinblums 1977).

Vegetative buffer effects on microclimate are mostly unaffected at distances greater than one tree height away from the stand edge (Chen 1991).

SEDIMENT FILTERING: About one site-potential tree height would be effective to remove sediment (filter) in most situations if the buffer were measured from the edge of the floodplain (Broderson 1973).

EFFECTS OF FIRE:

Wildfires may result in improved and rejuvenated habitat for salmonids and increased productivity increasing fish populations over the long-term. (Minshall, G.W. and J.T. Brock 1991, Burton 2000)

In the case of high-intensity wildfires, local extirpation of fishes is patchy and recolonization is rapid. Lasting detrimental effects have been limited to areas where native populations have declined and become isolated from anthropogenic activities (Gresswell, R.E. 1999)

Use of cool burns in spring when the ground is moist, providing an unburned buffer along stream channels, maintaining integrity of the soil surface, and leaving and protecting snags during burning, should help prevent or limit undesirable impacts to fish and wildlife. Staggering prescribed fires over time, and spacing of burns across the landscape will minimize impacts... (McMahon, E. and D.S. deCalesta 1990).

The following was extracted from : Rieman, B.D. 1995. Proceedings- Fire Effects on Rare and Endangered Species and Habitats Conference, Nov 13-16, 1995. Coeur d' Alene, Idaho IAWF, 1997.

"The potential for wildfire to impact aquatic ecosystems and their associated threatened, endangered, or sensitive species is of increasing concern. Recent (since 1988) large-scale fires followed by dramatic hydrologic disturbances spark much of this interest. Broad

swaths of western forest lands, where fire suppression and past silvicultural activities have radically altered vegetation structure and fuel loads, are ripe for high-intensity fires. The potential seems greatest in warm/dry habitat types that historically were dominated by frequent, but low intensity burns. Interconnected, fuel-laden stands may now link areas that historically burned less frequently or uniformly into large, homogeneous areas that are vulnerable to high-intensity, stand replacing events (Agee 1988; Henjum et al. 1994). Recent fires in the Pacific Northwest seem to confirm these expectations.”

“Wildfires influence aquatic ecosystems both directly and indirectly. Direct effects include heating or abrupt changes in water chemistry (Minshall et al. 1989; McMahon and de Calesta 1990). Indirect effects include changes in hydrologic regime, erosion, debris flows, woody debris loading and riparian cover (Swanson and Lienkaemper 1978; Brown 1989; Megahan 1991; Bozek and Young 1994). Intense fires and related events have killed fish (Bozek and Young 1994) and even caused local extinctions (Propst et al. 1992; Rinne 1996). Conceivably, large and intense fires could threaten populations of sensitive salmonids such as bull trout, chinook salmon, steelhead, and others that are depressed from other causes. Historical fires, however, were a natural and potentially important part of the disturbance regime for terrestrial and aquatic systems (Reeves et al. 1995). Large fires supplied woody debris and triggered hydrologic events and debris flows that transported coarse substrates to stream channels. These processes may well have provided the materials that maintained productive habitats for fish and other organisms (Swanson et al. 1990; Reeves et al. 1995).”

“The magnitude and intensity of recent fires heighten concerns regarding forest/ecosystem health, the potential loss of valuable wood fiber and private property, and the apparent threat to sensitive species. Such concerns have galvanized new efforts to reduce fuel loads and stand densities through mechanical treatment and the use of prescribed fire. These efforts create a quandary for biologists and managers working with aquatic systems. The long-term negative effects of timber harvest activities on aquatic ecosystems are well documented (see papers in Meehan 1991 and Salo and Cundy 1987; Henjum et al. 1994) The effects of fire on fish are more equivocal. Do large fires really threaten extinction for many existing salmonid populations? What influences the risk?”

“Large fires in the Boise River basin on the Boise National Forest in 1992 and 1994 provided an opportunity to examine these questions relative to populations of two sensitive salmonids. Bull trout (*Salvelinus confluentus*) is a category-one species under the Endangered Species Act (ESA), and redband or interior rainbow trout (*Oncorhynchus mykiss*) is recognized as a species of special concern by the Idaho Department Fish and Game. Some isolated redband populations have been petitioned for formal listing under ESA. Both species inhabit streams caught within fires described as among the most destructive ever observed on the Forest. We initiated work on the responses of these fishes to wildfire and related effects in 1992. The work was planned as long term and much is incomplete. Our preliminary results and the body of literature regarding the disturbance and recovery of aquatic communities provide a base, however, to initiate the discussion.”

Fire Severity used in Terrestrial Ecology Assessment of ICBEMP. This table (Table 2) is from P. Morgan's paper:

Table 2. Fire severity classes used for our fire regime classification. Fire severity is determined based upon the extent of mortality of dominant vegetation (trees, or shrubs if no trees are present, or grasses if no trees or shrubs are present). To produce the maps in this study, we applied the fire severity classes to 1 km² pixels. Note that unburned areas within the fire perimeter are not considered; only burned areas are used as a basis for determining fire severity.

Fire Severity	Symbol	Description
Nonlethal	NL	More than 70% of the basal area or more than 90% of the canopy cover that existed prior to the burn is alive after the burn.
Mixed	M	Fires of intermediate effects, often consisting of fine-grained spatial patterns resulting from a mosaic of varying severity.
Stand-replacement	SR	Less than 20% of the basal area or less than 10% of the canopy cover of the overstory vegetation remains after the fire
Rarely burns	RB	Fires very seldom occur and are not one of the primary disturbance factors affecting vegetation structure, composition, and succession.

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Wu 1986

ATTACHMENT 3 - WATERSHED CONDITION AND RIPARIAN MANAGEMENT OBJECTIVES (RMO's) IN THE PRESCRIBED FIRE CRITERIA - THE MATRIX OF PATHWAYS AND INDICATORS:

Introduction

Watershed disruption has played a role in the decline of salmonids. Changes in or disruptions of watershed processes likely to influence characteristics of stream channels are also likely to influence the dynamics and persistence of bull trout populations. Bull trout have been more strongly associated with pristine or only lightly disturbed basins (Brown 1992; Clancy 1993; Cross and Everest 1995; Dambacher et al., [in press]; Huntington 1995; Ratliff and Howell 1992).

Patterns of stream flow and the frequency of extreme flow events that influence substrates are anticipated to be important factors in population dynamics (Rieman and McIntyre 1993). With overwinter incubation and a close tie to the substrate, embryos and juveniles may be particularly vulnerable to flooding and channel scour associated with the rain-on-snow events common in some parts of the range within the belt geography of northern Idaho and northwestern Montana (Rieman and McIntyre 1993). Channel dewatering tied to low flows and bed aggradation has also blocked access for spawning fish resulting in year class failures (Weaver 1992).

Changes in sediment delivery, aggradation and scour, wood loading, riparian canopy and shading or other factors influencing stream temperatures, and the hydrologic regime (winter flooding and summer low flow) are all likely to affect some, if not most, populations. Significant changes in any of these characteristics or processes represent important risks for fish populations. Populations are likely to be most sensitive to changes that occur in headwater areas encompassing critical spawning and rearing habitat and remnant resident populations. Severity of watershed disturbance correlates to watershed size, with smaller headwater systems having a greater probability of disruption following disturbance.

According to CRITFC (1994), Salmon survival and production depend upon substrate fine sediment and embeddedness, channel morphology (pool frequency and quality), streambank stability, and water quantity and timing, factors all of which are influenced by watershed condition.

Matrix of Pathways and Indicators

This section describes the Matrix of Pathways and Indicators (NOAA Fisheries, 1996 and USF&WS 1998). Indicators are provided to describe the condition of 1). Fish Populations, 2). Habitats, 3). Water Quality, 4). Channel and Hydrologic variables, and 5). Watershed Condition. The objective of the "Matrix of Diagnostics/Pathways and Indicators" (Tables 1 and 2) is to arrive at a determination of the potential affect of land management activities on a species. This matrix is divided into diagnostics/pathways (major rows in the matrix).

The diagnostics and pathways are broken down into “indicators”. **Numeric values are not presented as absolutes nor to define data standards.** They are presented as diagnostic tools to promote discussion of differences between local data or findings and values suggested in the matrix. If local data relating to a specific indicator is not available for comparison and verification, then proposed management activities should be designed to minimize impacts to that indicator. If a numeric indicator suggested in the matrix is not functionally attainable given the inherent characteristics of the watershed being considered or if an equivalent value is available using a different field technique, Level 1 and Interdisciplinary teams should replace the numeric value with local data and professional judgement. When this occurs, changes must be accompanied by rigorous discussion within the team, which is integrated into adequate documentation complete with supportive local data and the technique used to compile the data, and/or scientifically supported reasoning, logic, or professional judgement for the change.

The columns in the matrix correspond to levels of condition of the indicator. There are three condition levels: "functioning appropriately," "functioning at risk," and "functioning at unacceptable risk." These three categories of function are defined for each indicator in the “Matrix of Diagnostics/Pathways and Indicators”.

Watershed Condition: In concept, watershed condition indicators in the Matrix (road density, disturbance history, RHCA’s, and disturbance regime) are usually “functioning appropriately” when the watershed has not been disturbed by high road density, reduced overstory cover, or have not been disrupted by disturbance events, such as catastrophic flood and/or fire, as described in the matrix. In the prescribed fire criteria, this portion of the matrix is used to define watershed condition (functionality). *Use Table 1* to determine if the watershed condition is functioning appropriately.

Riparian Management Objectives (RMOs): The channel, water quality, and channel/hydrologic indicators in the Matrix are used to describe the condition of RMOs as applied to the Salmonid Criteria for prescribed fire. All of the indicators relevant to the aquatic ecosystem associated with the project should be applied. Large woody debris, for example, would not be a relevant indicator in a non-forested stream. Most indicators, however, are applicable in most situations. *Use Table 2* to determine if the project would not prevent or retard attainment of RMO condition.

Scales: US Fish and Wildlife Service (1998) recommends that the matrix be applied to individual actions or grouped similar activities at the 5th or 6th field Hydrologic Unit Code (HUC) watershed scale. This is consistent with the watershed size identified in the Conditional Statements associated with the Salmonid Criteria. Therefore, watershed condition indicators are to be applied at the same scale. Habitat indicators, however, may be applied at a finer scale. As stated in PACFISH and INFISH, RMO’s should reflect conditions of a specific stream reach based on local geology, topography, climate, and potential vegetation. Thus RMO’s are normally applicable to a specific stream or stream reach, and there may be multiples of these in the same HUC.

Table 1. Matrix of Pathways and Indicators – Watershed Condition

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
Watershed Conditions:	Road Density & Location	<1mi/mi ¹³ ; no valley bottom roads	1 - 2.4 mi/mi ¹³ ; some valley bottom roads	>2.4 mi/mi ¹³ ; many valley bottom roads
	Disturbance History	<15% ECA of entire watershed with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area there is an additional criteria of 15% LSOG in watersheds ¹⁴	<15% ECA of entire watershed but disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area there is an additional criteria of 15% LSOG in watersheds ¹⁴	>15% ECA of entire watershed and disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; does not meet NWFP standard for LSOG
	Riparian Conservation Areas (RHCA - PACFISH and INFISH) (Riparian Reserves - Northwest Forest Plan)	The riparian conservation areas provide adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/ composition >50% ¹⁵	Moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian conservation areas, or incomplete protection of habitats and refugia for sensitive aquatic species (70-80% intact), and adequately buffer impacts on rangelands : percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better ¹⁵	Riparian conservation areas are fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species (<70% intact, refugia does not occur), and adequately buffer impacts on rangelands : percent similarity of riparian vegetation to the potential natural community/composition <25% ¹⁵
	Disturbance Regime	Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. ¹ Natural processes are stable.	Scour events, debris torrents, or catastrophic fire are localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate.	Frequent flood or drought producing highly variable and unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire exists throughout a major part of the watershed. The channel is simplified, providing little hydraulic complexity in the form of pools or side channels. ¹

				Natural processes are unstable.
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Table 2. Matrix of Pathways and Indicators – Riparian Management Objectives - Fish Habitat

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
HABITAT:				
Water Quality:	Temperature	7 day average maximum temperature in a reach during the following life history stages: ^{1,3} incubation 2 - 5°C rearing 4 - 12 °C spawning 4 - 9°C also temperatures do not exceed 15 C in areas used by adults during migration (no thermal barriers)	7 day average maximum temperature in a reach during the following life history stages: ^{1,3} incubation <2°C or 6°C rearing <4°C or 13 - 15 °C spawning <4°C or 10°C also temperatures in areas used by adults during migration sometimes exceeds 15°C	7 day average maximum temperature in a reach during the following life history stages: ^{1,3} incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)
	Sediment (in areas of spawning and incubation; rearing areas will be addressed under substrate embeddedness)	Similar to chinook salmon ¹ : for example (e.g.): < 12% fines (<0.85mm) in gravel ⁴ ; e.g. ≤20% surface fines of ≤6mm ^{5,6}	Similar to chinook salmon ¹ : e.g. 12-17% fines (<0.85mm) in gravel ⁴ ; e.g. 12-20% surface fines ⁷	Similar to chinook salmon ¹ : e.g. >17% fines (<0.85mm) in gravel ⁴ ; e.g. >20% fines at surface or depth in spawning habitat ⁷
	Chemical Contamination/ Nutrients	Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches ⁸	Moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach ⁸	High levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach ⁸
Habitat Access:	Physical Barriers (address subsurface flows impeding fish passage under the pathway flow/hydrology)	Man-made barriers present in watershed allow upstream and downstream fish passage at all flows	Man-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows	Man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
Habitat Elements:	Substrate Embeddedness in rearing areas (spawning and incubation areas were addressed under the indicator sediment)	Reach embeddedness <20% ^{9,10}	Reach embeddedness 20-30% ^{9,10}	Reach embeddedness >30% ^{4,10}
	Large Woody Debris	Current values are being maintained at greater than 80 pieces/mile that are >24" diameter and >50 ft length on the Coast ⁹ , or >20 pieces/ mile >12" diameter >35 ft length on the Eastside ¹¹ ; also adequate sources of woody debris are available for both long and short-term recruitment	Current levels are being maintained at minimum levels desired for functioning appropriately, but potential sources for long term woody debris recruitment are lacking to maintain these minimum values	Current levels are not at those desired values for functioning appropriately, and potential sources of woody debris for short and/or long term recruitment are lacking
	Pool Frequency and Quality	Pool frequency in a reach closely approximates ⁵ : <div> <u>Wetted width (ft)</u> <u>#pools/mile</u> 0-5 39 5-10 60 10-15 48 15-20 39 20-30 23 30-35 18 35-40 10 40-65 9 65-100 4 (can use formula: pools/mi = <u>5,280/wetted channel width</u>); #channel widths per pool); also, pools have good cover and cool water⁴, and only minor reduction of pool </div>	Pool frequency is similar to values in functioning appropriately, but pools have inadequate cover/temperature ⁴ , and/or there has been a moderate reduction of pool volume by fine sediment	Pool frequency is considerably lower than values desired for functioning appropriately; also cover/temperature is inadequate ⁴ , and there has been a major reduction of pool volume by fine sediment

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
		volume by fine sediment		
	Large Pools (in adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at baseflow)	Each reach has many large pools >1 meter deep ⁴	Reaches have few large pools (>1 meter) present ⁴	Reaches have no deep pools (>1 meter) ⁴
	Off-channel Habitat (see reference 18 for identification of these characteristics)	Watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are low energy areas ⁴	Watershed has some ponds, oxbows, backwaters, and other off-channel areas with cover; but side-channels are generally high energy areas ⁴	Watershed has few or no ponds, oxbows, backwaters, or other off-channel areas ⁴
	Refugia (see Checklist footnotes for definition of this indicator)	Habitats capable of supporting strong and significant populations are protected and are well distributed and connected for all life stages and forms of the species ^{12, 13}	Habitats capable of supporting strong and significant populations are insufficient in size, number and connectivity to maintain all life stages and forms of the species ^{12, 13}	Adequate habitat refugia do not exist ¹²
Channel Condition & Dynamics:	Average Wetted Width/ Maximum Depth Ratio in scour pools in a reach	$\leq 10^{7.5}$	11 - 20 ⁵	>20 ⁵
	Streambank Condition	>80% of any stream reach has $\geq 90\%$ stability ⁵	50 - 80% of any stream reach has $\geq 90\%$ stability ⁵	<50% of any stream reach has $\geq 90\%$ stability ⁵
	Floodplain Connectivity	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	Reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
Flow/Hydrology:	Change in Peak/ Base Flows	Watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	Some evidence of altered peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	Pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography
	Increase in Drainage Network	Zero or minimum increases in active channel length correlated with human caused disturbance	Low to moderate increase in active channel length correlated with human caused disturbance	Greater than moderate increase in active channel length correlated with human caused disturbance

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⁴ Washington Timber/Fish Wildlife Cooperative Monitoring Evaluation and Research Committee, 1993. Watershed Analysis Manual (Version 2.0). Washington Department of Natural Resources.

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¹⁴ Northwest Forest Plan, 1994. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service and USDI Bureau of Land Management.

¹⁶ Winward, A.H., 1989 Ecological Status of Vegetation as a base for Multiple Product Management. Abstracts 42nd annual meeting, Society for Range Management, Billings MT, Denver CO: Society For Range Management: p277.

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ATTACHMENT 4

NOXIOUS WEED RISK ASSESSMENTS

AND

GLYPHOSATE HERBICIDE RISK ASSESSMENT

NOXIOUS WEEDS – AQUATIC RESOURCE RISKS

ABSTRACT

Noxious weeds, by definition, exert substantial negative environmental impacts. The following exotic plants have the greatest impacts on stream/riparian areas in the Northwest: spotted knapweed, oxeye daisy, Canada thistle, bull thistle, musk thistle, cheat grass, Scotch thistle, leafy spurge, yellow hawkweed, yellow toadflax, purple loosestrife, salt cedar (tamarisk), and sulfur cinquefoil (An Assessment of Ecosystem Components in the Interior Columbia Basin, 1997). These plants may colonize or invade riparian communities, displacing native plants within the wetlands adjacent to streams. Many of these species have the ability to reproduce vigorously in the riparian zone. Their rapid rate of growth allows them to out-compete more desirable riparian vegetation such as cottonwoods, willows, and sedges. The resultant loss of functional riparian communities, loss of rooting strength and protection against erosion, can lead to destruction of salmonid habitat. Purple loosestrife can invade, replace and crowd out native riparian communities within whole wetlands in just a few seasons. Adverse effects of noxious weeds in riparian areas can be summarized within 4 major areas:

- 1). Replacement of native vegetation communities by invaders which simply out-compete the native plants.
- 2). One species may replace several to numerous species significantly reducing biodiversity.
- 3). Replacement of native vegetation alters co-evolved relationships to wildlife and fish. As native species are crowded out, alterations in habitat result from reduced streambank protection, loss of undercut bank cover, loss of overhanging vegetation cover, reduced pool depth and volume, increased erosion and fine sediment deposition on the substrate, increased stream width and thermal relationships, and decreased detrital and nutrient inputs to the stream.
- 4). Altered natural ecosystem processes may result from the conversion of native to exotic plant communities. Tamarisk, for example, alters the natural hydrologic cycle increasing transpiration, decreasing streamflow, and lowering water tables below the reach of water-dependant vegetation communities.

In the uplands, cheat grass invasion can result in vegetative cover inadequate to provide suitable watershed protection. Although studies concerning the effects of noxious weeds on hydrologic systems are generally lacking, there is growing evidence that invasions of exotic plants into native plant communities can result in increased surface runoff and sediment yield (An Assessment of Ecosystem Components in the Interior Columbia Basin, 1997).



An Assessment of Ecosystem Components in the Interior Columbia Basin

And Portions of the Klamath and Great Basins: Volume II

Thomas M. Quigley
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Technical Editors

Volume II contains pages 337 through 1,055

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Exotic Plants-Noxious Weeds

This subsection is primarily a summarization of Karl and others (1995), an ICBEMP report which focused on exotic plants that have proven to be problematic on Basin rangelands and riparian areas. Additional information regarding exotic plants on forested lands is incorporated into this subsection, primarily from the Invaders database (ICBEMP Invaders database 1995⁴).

Historical trends—The Basin has experienced numerous exotic plant invasions in the last 100 years [(Franklin and Dyrness 1973, Yensen 1981, and Young and others 1972), in Mack 1986]. Presently, there are approximately 862 species of exotic plants existing within the Pacific Northwest (Washington, Oregon, Idaho, Montana, and Wyoming; Rice 1994). Nearly all of these 862 species inhabit the Basin. These 862 exotic plant species represent 43 percent of the estimated 2,000 exotic plant species present in the entire United States (U.S. Congress, Office of Technology Assessment 1993, in Vitousek and others 1996).

⁴ ICBEMP Invaders database. 1995. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA 99362.

Many of the exotic plants existing within the Basin originated in the Mediterranean region. The climate of the Mediterranean region (wet, cool autumns and winters; and dry, hot summers) is similar to the climate of the Basin, particularly the portion of the Basin that lies west of the Rocky Mountains. Thus, many exotic plants are adapted to the Basin climate (Trewartha 1981, in Mack 1986; Young and others 1972, in Mack 1986).

Euro-American settlement of the Basin in the late-1800s facilitated the invasion and expansion of exotic plants. Agricultural practices were the major avenue by which exotic plants initially entered the Basin. The seed of many exotic plants was a contaminant of crop seed, and some exotic plants were deliberately introduced to provide livestock forage. The severe depletion of native bunchgrasses on Basin rangelands, caused by livestock overgrazing and trampling, was often the impetus for deliberate introductions of forage species (Mack 1981, in Mack 1986). Thus, the land-use change from wildlands to agriculture—a transition that was the most prevalent change between the historical and the current periods—has promoted invasions of numerous exotic plants in the Basin. Not surprisingly, this change in land use has promoted invasions of exotic plants on a global scale as well (Vitousek and others 1996).

Noxious weeds: a subset of exotic plants—Of the 862 exotic plants existing within the 5-state region (Washington, Oregon, Idaho, Montana, and Wyoming) of the Pacific Northwest, 115 species have been legally declared as “noxious weeds” by at least one of the five states. “Noxious” is a legal classification and not an ecological term. Plants that can exert substantial negative environmental or economic impact can be designated as “noxious” by various governmental agencies. Of the 25 exotic plant species listed in table 3.13, 24 are legally declared noxious in at least one of five Basin states. These 24 noxious weeds represent a subset of the 115 noxious weeds.

Success of exotic plants-noxious weeds—Present distributions of many exotic plants within the Basin, including the noxious weeds, are in-

creasing rapidly and in some cases exponentially (Asher 1994, Rice 1994, Rice and Rider 1995). This rapid rate of expansion is partly attributable to the life history of exotic plants. Exotic plants are often opportunists, and many are pioneer, colonizing species. They are frequently one of the first species to arrive and colonize areas that have experienced soil-surface disturbance or areas that lack plant cover. Their establishment and spread is aided by disturbance to the soil surface (Baker 1986, Bazzaz 1986). Exotic plants that are characterized as having an opportunistic, colonizing life history—referred to as “colonizers” by Bazzaz (1986)—are typically prolific producers of disseminules and often are adapted to long-distance dispersal by means of vehicles, wind, wildlife, livestock, water, or machinery. They usually germinate under a wide variety of conditions, establish quickly, exhibit fast seedling growth, and out-compete native species for water and nutrients.

Other exotic plants, such as the noxious weeds spotted knapweed, yellow starthistle, and leafy spurge, can be categorized as “invaders” (Bazzaz 1986). Invaders can establish within relatively intact vegetation cover, and displace the native species without the aid of soil-surface disturbance. While noxious weeds can be colonizers or invaders or both, depending on the plant community, it is noteworthy and perhaps indicative of their noxious weed status that many of them act as invaders. For example, spotted knapweed, yellow starthistle, and leafy spurge have exhibited the ability to invade relatively undisturbed sites, including wilderness areas and National Parks (Asher 1994, Tyser and Key 1988).

Reasons why exotic plants-noxious weeds are problematic—Exotic plants, including noxious weeds, represent biological invasions. As agents of global change, exotic plants were rated as highly as climate change by Vitousek and others (1996). The invasive potential of exotic plants can alter the biophysical template by altering ecosystem processes. Vitousek and others (1996) listed examples of potentially altered ecosystem processes including: (1) primary productivity, (2) decompo-

sition, (3) hydrology, (4) nutrient cycling, and (5) natural disturbance regimes. Alteration of these processes by exotic species can lead to displacement of native biota.

The invasion of exotic plants can change the structure, composition, and successional pathways of ecosystems at various scales (from the landscape element to subregional scale). An example of the subregional scale is the invasion and dominance of cheatgrass and/or medusahead in the Snake River Plains of the Owyhee Uplands ERU. The establishment of potential vegetation that is representative of the biophysical template can be prevented by exotic plant invasion. In effect, potential vegetation can be changed from a native plant type to an exotics type. The reduction in biodiversity at all scales is a possible response of this change in potential vegetation. Indeed, Billings (1994) warns that in the cheatgrass-dominated areas of the Intermountain region, including the Snake River Plains of the Owyhee Uplands ERU, some native biota are in danger of extirpation at the local or regional scale.

Although studies concerning the effects of exotic plants on hydrologic systems are generally lacking, accumulating evidence is revealing that invasions of exotic plants into native plant communities can result in increased surface runoff and sediment yield, particularly at the plot scale (Lacey and others 1989). Watershed-scale studies of the hydrological effects of exotic plant invasion would be helpful in clarifying the effects to aquatic ecosystems.

The fact that exotic plants can function as agents of change of native succession/disturbance regimes has frequently been addressed in this chapter. Exotic annual grasses, for example cheatgrass, medusahead, and ventenata, can produce relatively greater amounts of flammable, fine fuels compared with native herbaceous species. Susceptibility to wildfire tends to increase in the effected cover types as fine-fuel loads become greater, thus shortening the fire-return interval. Native plants that are not adapted to the shortened fire-return interval

cannot sustain their populations. As native plant populations decline, exotic annual grasses incrementally gain in dominance, further perpetuating the shortened fire-return interval.

Conversely, the presence of some exotic forbs might lengthen fire-return intervals. Bushey (1995) reports that plant communities dominated by diffuse knapweed or spotted knapweed are difficult to burn because of a lack of fine fuels. Bushey (1995) speculates that the lack of fine fuels is attributable to allelopathy by these forbs. Another causal mechanism might be the aboveground morphology of these forbs, which in comparison to graminoids is skewed toward greater stem material production rather than leaf production. Allelopathy and prevalence of stem material would reduce the likelihood of fire spread between plants. Experimental studies would aid in clarifying the relation of exotic forbs to fire and disturbance regimes.

Susceptibility of broad-scale cover types to invasion, and broad-scale distribution of 25 selected exotic plants

Dewey and others (1991) propose that “The precision and usefulness of federal weed control Environmental Assessment (EA) and Environmental Impact Statement (EIS) documents would be significantly improved by knowing the exact location and extent of lands vulnerable to specific noxious weeds.” We endeavored to do just that by developing a Susceptibility to Invasion Index for 38 broad-scale Basin cover types and characterizing their susceptibility to invasion by the 25 focal exotic plants (table 3.174).

Of the 25 exotic plant species assessed in Karl and others (1995), 11 exhibit a somewhat restricted county distribution in the Basin; and 14 exhibit a widespread county distribution in the Basin (table 3.13). County distributions for widespread species ranged from 48 counties for oxeye daisy (*Chrysanthemum leucanthemum*) to all 97 counties located within the five Basin states (Washington, Oregon, Idaho, Montana, and Wyoming) for Canada thistle and cheatgrass. County distributions for the somewhat restricted species ranged from four counties for squarrose knapweed (*Centaurea virgata*) to 55 counties for yellow starthistle.

County-distribution maps for these 25 species can be found in Karl and others (1995) and Rice and Rider (1995).

The susceptibility of Basin cover types to invasion, and distributional patterns of the 25 focal exotic plants are described in detail as follows:

(A) Exotic plants with somewhat restricted distributions:

Common crupina (*Crupina vulgaris*)

The distribution of common crupina is disjunct with populations existing in Washington, Oregon, and Idaho. Common crupina is particularly prevalent in north-central Idaho, where the Columbia Plateau, Blue Mountains, and Central Idaho Mountains ERUs meet. Sites that are particularly susceptible to invasion in the aforementioned ERU convergence area and presently support populations of common crupina are southern slopes in steep canyon grasslands (for example, the wheatgrass bunchgrass and fescue-bunchgrass cover types; rated of moderate susceptibility to invasion; table 3.174) and areas at elevations of approximately 300 to 1,000 meters and within a 38 to 76 centimeters annual precipitation zone.⁵

Dyers woad (*Isatis tinctoria*)

Populations of Dyers woad exist throughout the Basin, but distribution by county is scattered. The area of greatest prevalence is in southeast Idaho, in the Snake Headwaters and Upper Snake ERUs. At present, the Northern Cascades, Columbia Plateau, and Northern Glaciated Mountains ERUs are primarily outside the distribution of Dyers woad. Numerous cover types are of high susceptibility to invasion by Dyers woad, including grasslands (fescue-bunchgrass and wheatgrass bunchgrass), shrublands (big sagebrush, low sagebrush, mountain big sagebrush), and agricultural lands (cropland/hay/pasture) (table 3.174).

Halogeton (*Halogeton glomeratus*)

The distribution of halogeton is restricted primarily to southeast Oregon and southern Idaho, in the Northern Great Basin, Owyhee Uplands, and Upper Snake ERUs. Halogeton populations in these ERUs are restricted primarily to (1) elevations of 700 to 2,200 meters, (2) saline soils, (3) annual precipitation zones of approximately 12.5 to 33.0 centimeters, and (4) the salt desert shrub cover type, which is of high susceptibility to invasion by halogeton (table 3.174).

Mediterranean sage (*Salvia aethiopsis*)

The distribution of Mediterranean sage lies primarily in Oregon and north-central Idaho. An area of great prevalence is in southeast Oregon, particularly in the Northern Great Basin ERU. At present, the Northern Cascades, Southern Cascades, Northern Glaciated Mountains, Lower Clark Fork, Upper Clark Fork, Upper Snake, and Snake Headwaters ERUs are primarily outside the distribution of this species. The grassland cover types (fescue-bunchgrass and wheatgrass bunchgrass) and the big sagebrush cover type are of high susceptibility to invasion by Mediterranean sage (table 3.174) and support populations of this species.

Medusahead (*Taeniatherum caput-medusae*)

The present distribution of medusahead is in the western portion of the Basin, but medusahead is spreading eastward. Areas of great prevalence are in the Columbia Plateau, Northern Great Basin, Blue Mountains, and Owyhee Uplands ERUs in Oregon and Idaho. Currently, the Lower Clark Fork, Upper Clark Fork, Central Idaho Mountains, Upper Snake, and Snake Headwaters ERUs are primarily outside the distribution of medusahead. Sites that are susceptible to medusahead establishment and support populations are characterized by (1) the presence of vertic soils (soils with a substantial clay component that shrink and

⁵ Personal communication. 1995. Peter M. Rice, Research Associate, Division of Biological Sciences, University of Montana, Missoula, MT 59812-1002.

swell from drying or wetting); (2) an annual precipitation zone of 25 to 100 centimeters; (3) an elevation of less than 1,400 meters; and (4) numerous cover types, particularly grassland (wheatgrass bunchgrass and fescue-bunchgrass), shrubland (low sagebrush and big sagebrush), and juniper cover types (juniper/sagebrush and juniper woodland), all of which are of moderate susceptibility to invasion (table 3.174).

Orange and yellow hawkweeds (*Hieracium aurantiacum*, *H. pratense*)

The distributions of these two species are similar. Both have distributions centered in the Idaho panhandle, northwest Montana, and northeast Washington, in the Northern Glaciated Mountains and Lower Clark Fork ERUs. Sites that are susceptible to invasion by the hawkweeds in the aforementioned locations include elevations exceeding 600 meters and mountain meadows. The herbaceous wetlands and cottonwood/willow cover types are of high susceptibility to invasion by orange and yellow hawkweed, respectively (table 3.174).

Rush skeletonweed (*Chondrilla juncea*)

The distribution of rush skeletonweed primarily lies within the Columbia Plateau, Blue Mountains, Central Idaho Mountains, and Owyhee Uplands ERUs. Areas of great prevalence are in southwest Idaho in the Owyhee Uplands ERU, and in eastern Washington in the Columbia Plateau ERU. Cover types that are of high susceptibility to invasion and support populations of rush skeletonweed are cropland/hay/pasture and exotic forbs/annual grass (table 3.174). Other cover types, rated of moderate susceptibility in table 3.174, that also are of particular susceptibility to invasion are big sagebrush, wheatgrass bunchgrass, and bitterbrush/bluebunch wheatgrass.⁶

⁶ Personal communication. 1995. Peter M. Rice, Research Associate, Division of Biological Sciences, University of Montana, Missoula, MT 59812-1002.

Squarrose knapweed (*Centaurea virgata*)

The distribution of this species lies primarily in the Blue Mountains and Owyhee Uplands ERUs in Oregon. Its areal extent in the aforementioned ERUs is minor (< 350 ha in 1990) and is primarily in the Blue Mountains ERU. Cover types that are susceptible to squarrose knapweed establishment and support populations include juniper/sagebrush, juniper woodland, and big sagebrush (Roche and Burrill 1992), all of which are of moderate susceptibility to invasion (table 3.174).

Sulfur cinquefoil (*Potentilla recta*)

The distribution of sulfur cinquefoil primarily lies within the Northern Glaciated Mountains, Upper Clark Fork, Lower Clark Fork, Central Idaho Mountains, and Blue Mountains ERUs. Its distribution is expanding to the west and south, within the Basin. Areas of great prevalence are in the Upper Clark Fork, Lower Clark Fork, and Northern Glaciated Mountains ERUs in the Idaho panhandle and western Montana. Cover types that are of high susceptibility to invasion and support populations of this species in the aforementioned ERUs include grasslands (fescue-bunchgrass, wheatgrass bunchgrass, and herbaceous wetlands), the drier forests (interior ponderosa pine and interior Douglas-fir), and the exotic forbs/annual grass type (table 3.174).

Yellow starthistle (*Centaurea solstitialis*)

The distribution of yellow starthistle includes portions of all ERUs except the Snake Headwaters, and possibly the Upper Snake. The areas of greatest prevalence are in the Columbia Plateau and Blue Mountains ERUs in extreme southeast Washington and the Idaho panhandle, and the Owyhee Uplands ERU in southwest Idaho. Cover types that are of high susceptibility to invasion and support populations of this species in the aforementioned ERUs include grasslands

Table 3.174—Cover type Susceptibility to Invasion Index by 25 exotic plant species (24 legally-declared noxious, plus cheatgrass).

Exotic Plant Species Code ¹																													
Cover Type	Brte	Canu	Caspp	Cedi	Cema	Cere	Ceso	Cevi	Chju	Chle	Ciar	Civu	Crvu	Eues	Hagl	Hiau	Hipr	Isti	Lida	Livu	Lysa	Onac	Pore	Saae	Taas	Total			
																										H	M	L	U
Alpine Tundra	L ²	L	L	L	L	L	L	L	L	L	M	M	L	L	L	M	L	L	M	L	L	L	U	L		0	4	20	1
Aspen	M	M	M	M	M	M	M	M	M	M	H	M	M	M	M	M	M	M	M	M	L	U	M	U	M	1	21	1	2
Big Sagebrush	H	U	M	M	M	M	M	M	M	U	M	M	L	M	M	L	L	H	M	M	L	M	U	H	M	3	15	4	3
Bitterbrush / Bluebunch Wheatgrass	H	M	M	H	M	U	M	M	U	U	M	M	M	M	M	L	L	M	M	M	L	U	M	U	M	2	15	3	5
Chokecherry / Serviceberry/Rose	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	H	M	M	M	M	M	U	M	1	23	0	1
Cottonwood / Willow	M	M	M	M	H	M	M	M	M	H	H	M	L	H	L	M	H	M	M	M	M	M	M	U	M	5	17	2	1
Cropland / Hay / Pasture	M	M	H	M	H	M	H	M	H	M	M	M	M	H	M	M	M	H	M	M	L	M	M	U	M	6	17	1	1
Engelmann Spruce / Subalpine Fir	H	H	M	M	M	M	M	M	M	H	H	H	L	M	L	M	M	L	M	M	M	U	M	U	M	5	15	3	2
Exotic Forbs / Annual Grass	H	M	H	M	M	M	H	H	H	M	M	M	M	M	M	M	M	H	H	H	M	M	H	M	M	9	16	0	0
Fescue-Bunchgrass	H	H	M	H	H	M	H	M	M	M	H	H	M	H	M	L	L	H	H	H	L	M	H	H	M	13	9	3	0
Grand Fir / White Fir	M	M	M	M	M	M	M	M	M	M	M	M	L	M	L	M	U	L	M	M	M	U	M	U	M	0	19	3	3
Herbaceous Wetlands	M	M	M	M	H	M	H	M	L	H	H	M	L	M	L	H	M	M	M	H	H	M	H	U	M	8	13	3	1
Interior Douglas-fir	H	H	M	M	H	M	M	M	M	M	H	H	M	M	M	M	M	M	M	M	L	M	H	U	M	6	17	1	1
Interior Ponderosa Pine	H	M	M	H	H	M	M	M	M	M	M	M	M	M	M	L	L	M	M	M	L	M	H	U	M	4	17	3	1
Juniper / Sagebrush	M	M	M	M	M	U	M	M	M	U	M	M	L	M	M	L	L	H	M	M	L	U	U	U	M	1	15	4	5
Juniper Woodlands	M	M	M	M	M	U	M	M	M	U	M	M	L	M	M	L	L	M	M	M	L	U	M	U	M	0	17	4	4
Limber Pine	M	M	M	M	M	M	M	M	M	M	M	M	M	L	M	M	L	M	M	M	L	L	M	U	M	0	20	4	1
Lodgepole Pine	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	M	M	M	L	M	M	U	M	0	22	2	1
Low Sagebrush	M	U	M	M	U	U	M	M	U	U	M	M	L	M	M	L	L	H	M	U	L	U	U	U	M	1	11	4	9
Mixed-Conifer Woodlands	H	M	M	M	H	M	M	M	M	U	H	M	L	M	M	L	L	M	M	M	L	U	H	U	M	4	14	4	3
Mountain Big Sagebrush	H	M	M	M	M	M	M	M	M	U	M	M	L	M	M	L	L	H	M	M	L	M	M	U	M	2	17	4	2
Mountain Hemlock	M	M	M	M	M	M	M	M	M	M	M	M	L	L	L	M	M	L	M	M	M	L	M	U	M	0	19	5	1
Mountain Mahogany	M	M	M	M	M	M	H	M	U	U	M	M	M	M	M	L	L	M	H	M	L	U	M	H	M	3	16	3	3
Native Forb	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	M	M	M	M	M	H	U	M	1	21	2	1

Table 3.174 (continued).

Exotic Plant Species Code ¹																														
Cover Type	Brte	Canu	Caspp	Cedi	Cema	Cere	Ceso	Cevi	Chju	Chle	Ciar	Civu	Crvu	Eues	Hagl	Hiau	Hipr	Isti	Lida	Livu	Lysa	Onac	Pore	Saae	Taas	Total				
																										H	M	L	U	
Oregon White Oak	M	U	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	M	U	M	L	M	M	U	M	0	19	3	3
Pacific Ponderosa Pine	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	M	M	M	L	M	M	U	M	0	21	3	1
Pacific Silver Fir / Mountain Hemlock	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	L	M	M	L	M	M	M	L	M	U	M	0	19	5	1
Red Fir	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	L	M	M	L	M	M	M	L	M	U	M	0	19	5	1
Salt Desert Shrub	M	M	M	L	L	M	L	M	L	L	M	M	L	M	H	L	L	L	L	L	L	L	L	U	L	1	8	15	1	
Shrub or Herb / Tree Regen	M	M	M	M	M	M	M	M	H	M	M	M	M	M	M	M	L	M	M	M	L	M	H	U	M	2	20	2	1	
Shrub Wetlands	M	H	M	M	H	M	M	M	L	M	H	H	L	M	L	M	M	M	M	M	H	M	M	U	M	5	16	3	1	
Sierra Nevada Mixed-Conifer	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	M	M	M	L	M	M	U	M	0	21	3	1	
Western Larch	M	M	M	M	M	M	M	M	M	M	H	M	M	M	M	M	M	M	M	M	L	M	M	U	M	1	22	1	1	
Western Redcedar / Western Hemlock	M	H	M	M	M	M	M	M	M	H	H	H	L	M	L	M	M	L	M	M	M	U	M	U	M	4	16	3	2	
Western White Pine	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	U	M	U	M	0	22	1	2	
Wheatgrass Bunchgrass	H	M	M	H	H	M	H	M	M	M	H	M	M	M	M	L	L	H	H	M	L	M	H	H	M	9	13	3	0	
Whitebark Pine	L	L	L	L	L	L	L	M	L	L	M	M	L	L	L	M	L	L	M	L	L	L	L	U	M	0	6	18	1	
Whitebark Pine / Subalpine Larch	L	L	L	L	L	L	L	L	L	L	M	M	L	L	L	M	L	L	M	L	L	L	L	U	L	0	4	20	1	
Total H	10	5	2	4	9	0	6	1	3	4	11	5	0	3	1	1	1	9	4	3	2	0	9	4	0					
Total M	25	27	33	30	24	31	28	35	26	22	27	33	19	28	25	21	14	19	32	30	10	19	22	1	35					
Total L	3	3	3	4	4	3	4	2	6	4	0	0	19	7	12	16	22	10	1	4	26	8	4	0	3					
Total U	0	3	0	0	1	4	0	0	3	8	0	0	0	0	0	0	1	0	1	1	0	11	3	33	0					

¹ Species codes for exotic plants: Brte = cheatgrass; Canu = musk thistle; Caspp = whitetop; Cedi = diffuse knapweed; Cema = spotted knapweed; Cere = Russian knapweed; Ceso = yellow starthistle; Cevi = squarrose knapweed; Chju = rush skeletonweed; Chle = oxeye daisy; Ciar = Canada thistle; Civu = bull thistle; Crvu = common crupina; Eues = leafy spurge; Hagl = halogeton; Hiau = orange hawkweed; Hipr = yellow hawkweed; Isti = Dyers woad; Lida = dalmatian toadflax; Livu = yellow toadflax; Lysa = purple loosestrife; Onac = Scotch thistle; Pore = sulfur cinquefoil; Saae = Mediterranean sage; Taas = medusahead.

² Susceptibility classes: H = High susceptibility to invasion — Exotic plant species is an “invader” and invades the cover type successfully and becomes dominant or codominant even in the absence of intense or frequent disturbance; M = Moderate susceptibility to invasion — Exotic plant species is a “colonizer” and invades the cover type successfully because high intensity or frequency of disturbance impacts the soil surface or removes the normal canopy cover; L = Low susceptibility to invasion — Exotic plant species typically does not establish because the cover type does not provide suitable habitat; and U = Unknown susceptibility to invasion — Herbarium records did not indicate any association between the exotic plant and the cover type, and/or ecological requirements of the exotic plant are not available in the literature, and/or there was a lack of distribution records (for example, herbaria mounts) for the exotic plant, and/or the extent of the cover type in the Basin might be so minor as to prevent or restrict the probability of obtaining distribution records for the exotic plant within that cover type.

(fescue-bunchgrass and wheatgrass bunchgrass), agricultural lands (cropland/hay/pasture), and exotic forbs/annual grass (table 3.174). The areal extent of these highly susceptible cover types within the 30.0-to-63.5-centimeters precipitation zone of yellow starthistle is portrayed spatially in map 3.27. In descending order of extent (percent of ERU), ERUs with greater than or equal to 10 percent extent of lands of high susceptibility to invasion by yellow starthistle are: Upper Snake (29%), Columbia Plateau (27%), Blue Mountains (22%), Snake Headwaters and Upper Clark Fork (14% each), and Central Idaho Mountains and Northern Glaciated Mountains (10% each) (map 3.27). The extent of lands that are of high susceptibility to invasion in the Upper Snake and Snake Headwaters ERUs is notable because the distribution of yellow starthistle has not yet expanded into those ERUs.

(B) Exotic plants with widespread distributions:

Bull thistle (*Cirsium vulgare*)

The distribution of bull thistle includes portions of every ERU. About three-quarters of the Basin counties have confirmed the presence of bull thistle, with unconfirmed counties lying primarily in southern Idaho in the Owyhee Uplands and Upper Snake ERUs. Presence of bull thistle is suspected in these unconfirmed counties, however.⁷ Cover types of high susceptibility to invasion by bull thistle include some forest types (Engelmann spruce/subalpine fir, interior Douglas-fir, and western redcedar/western hemlock), grasslands (fescue-bunchgrass), and riparian types (shrub wetlands) (table 3.174).

Canada thistle (*Cirsium arvense*)

At the ERU and county scales, the distribution of Canada thistle is ubiquitous in the Basin. Populations are typically located within a 38- to 76-centimeters precipitation

zone. Numerous cover types are of high susceptibility to invasion, including grasslands (fescue-bunchgrass and wheatgrass bunchgrass), riparian types (cottonwood/willow, herbaceous wetlands, and shrub wetlands), and some forest types (aspen, Engelmann spruce/subalpine fir, interior Douglas-fir, and western redcedar/western hemlock) (table 3.174).

Cheatgrass (*Bromus tectorum*)

At the ERU and county scales, the distribution of cheatgrass is ubiquitous in the Basin. Areas of great prevalence include the Northern Great Basin, Owyhee Uplands, and Upper Snake ERUs. Cover types that are of high susceptibility to invasion and support cheatgrass populations in the aforementioned ERUs include grasslands (fescue-bunchgrass and wheatgrass bunchgrass), shrublands (big sagebrush), shrubland-grassland (bitterbrush/bluebunch wheatgrass), the drier forest types (interior ponderosa pine and interior Douglas-fir), and exotic forbs/annual grass (table 3.174). The areal extent of these highly susceptible cover types within the 15-to-56-centimeters precipitation zone of cheatgrass is portrayed spatially in map 3.26. In descending order of extent (percent of ERU), ERUs with greater than or equal to 25 percent extent of lands of high susceptibility to invasion by cheatgrass are: Owyhee Uplands (67%), Northern Great Basin (64%), Upper Snake (46%), Blue Mountains and Columbia Plateau (34% each), Upper Klamath (28%), and Upper Clark Fork (26%) (map 3.26).

Dalmatian toadflax (*Linaria dalmatica*)

The distribution of dalmatian toadflax includes portions of every ERU. Counties with unconfirmed dalmatian toadflax presence primarily lie in southeast Idaho in the Owyhee Uplands and Upper Snake ERUs. Cover types that are of high susceptibility to

⁷ Personal communication. 1995. Loal Vance, Idaho Department of Agriculture, 120 Klotz Lane, Boise, ID 83712.

invasion by this species include grasslands (fescue-bunchgrass and wheatgrass bunchgrass), mountain mahogany, and exotic forbs/annual grass (table 3.174).

Yellow toadflax (*Linaria vulgaris*)

The distribution of yellow toadflax includes portions of every ERU, but its distribution at the county scale is less extensive than dalmatian toadflax. Counties with unconfirmed presence lie primarily in the Columbia Plateau, Blue Mountains, and Owyhee Uplands ERUs. Cover types that are of high susceptibility to invasion include grasslands (fescue-bunchgrass and herbaceous wetlands) and exotic forbs/annual grass (table 3.174).

Diffuse knapweed (*Centaurea diffusa*)

The distribution of diffuse knapweed includes portions of every ERU. Counties with unconfirmed presence lie primarily in the Central Idaho Mountains, Upper Snake, and Snake Headwaters ERUs in Idaho. Areas of great prevalence lie within the Northern Glaciated Mountains, Northern Cascades, Southern Cascades, and Columbia Plateau ERUs in Washington and Oregon. Cover types that are of high susceptibility to invasion and support populations of diffuse knapweed in the aforementioned ERUs include grasslands (fescue-bunchgrass and wheatgrass bunchgrass), shrubland-grassland (bitterbrush/bluebunch wheatgrass), and dry forest (interior ponderosa pine) (table 3.174). The areal extent of these highly susceptible cover types within the 15-to-89-centimeters precipitation zone of diffuse knapweed is portrayed spatially in map 3.37. In descending order of extent (percent of ERU), ERUs with greater than or equal to 10 percent extent of lands of high susceptibility to invasion by diffuse knapweed are: Upper Klamath (37%), Blue Mountains (24%), Southern Cascades (23%), Upper Clark Fork (22%), Central

Idaho Mountains and Northern Cascades (18% each), Northern Glaciated Mountains (15%), and Columbia Plateau (13%) (map 3.37). The extent of lands that are of high susceptibility to invasion in the Upper Klamath and Blue Mountains ERUs is notable because diffuse knapweed is not reported to be prevalent in these ERUs at present; it is present, however, and spreading in the Blue Mountains ERU (Harrod and others 1996).

Whitetop (*Cardaria draba*, *C. chalapensis*, *C. pubescens*)

The distribution of the whitetop species complex includes portions of every ERU. Counties with unconfirmed presence are few and scattered across the Basin. Whitetop is particularly prevalent in northeast Oregon in the Blue Mountains ERU. Cover types that are of high susceptibility to invasion include agricultural lands (cropland/hay/pasture) and exotic forbs/annual grass (table 3.174). Whitetop commonly migrates from the cropland/hay/pasture cover type to the big sagebrush cover type, particularly with disturbance to the soil surface (Miller and others 1994, Smergut 1991).

Leafy spurge (*Euphorbia esula*)

There is confirmed presence of leafy spurge in about three-quarters of the counties in the Basin, and its distribution includes portions of every ERU. Counties with unconfirmed presence lie primarily in eastern Washington and eastern Oregon in the Northern Cascades, Columbia Plateau, Southern Cascades, and Northern Great Basin ERUs. The distribution of leafy spurge is expanding westward within the Basin. Areas of prevalence include the Northern Glaciated Mountains, Lower Clark Fork, and Upper Clark Fork ERUs in Montana, and the Upper Snake ERU. Cover types that are of high susceptibility to invasion and support populations of this species in the aforementioned ERUs include grasslands (fescue-bunchgrass), riparian

types (cottonwood/willow), and agricultural types (cropland/hay/pasture) (table 3.174). The areal extent of these highly susceptible cover types is portrayed spatially in map 3.36. In descending order of extent (percent of ERU), ERUs with greater than or equal to 10 percent extent of lands of high susceptibility to invasion by leafy spurge are: Columbia Plateau (49%), Upper Snake (39%), Blue Mountains (24%), Central Idaho Mountains, Owyhee Uplands and Snake Headwaters (14% each), and Northern Glaciated Mountains and Upper Clark Fork (13% each) (map 3.36). These percentages represent the extent of the cover types only, without regard for the precipitation range of leafy spurge; thus, the percentages are inflated and require adjustment downward as further information is collected.

Musk thistle (*Carduus nutans*)

The distribution of musk thistle includes portions of every ERU. Counties with unconfirmed presence are scattered across the Basin. Musk thistle is primarily restricted to mesic sites with moist, alluvial soils that receive greater than 25 centimeters of annual precipitation. Cover types of high susceptibility to invasion include grasslands (fescue-bunchgrass), riparian types (shrub wetlands), and some forest types (Engelmann spruce/subalpine fir, interior Douglas-fir, and western redcedar/western hemlock) (table 3.174).

Oxeye daisy (*Chrysanthemum leucanthemum*)

The distribution of oxeye daisy includes portions of all ERUs except the Owyhee Uplands and Upper Snake. County distribution for oxeye daisy is centered in the northern and eastern portions of the Basin. Cover types of high susceptibility to invasion include riparian types (cottonwood/willow and herbaceous wetlands) and some forest types (Engelmann spruce/subalpine fir and western redcedar/western hemlock) (table 3.174).

Purple loosestrife (*Lythrum salicaria*)

The distribution of purple loosestrife is ubiquitous at the ERU scale, and widespread but scattered at the county scale. Purple loosestrife is restricted to wetland habitats. Areas of greatest prevalence include the Northern Glaciated Mountains, Columbia Plateau, and Owyhee Uplands ERUs in these river valleys: Okanogan, Yakima, Columbia, Snake, Owyhee, and Boise. Cover types of high susceptibility to invasion include the riparian types (herbaceous wetlands and shrub wetlands) (table 3.174).

Russian knapweed (*Centaurea repens*)

The distribution of Russian knapweed is ubiquitous at the ERU scale. Counties with unconfirmed presence lie primarily in Idaho. Areas of prevalence include the Owyhee Uplands and Upper Snake ERUs in Idaho, and the Columbia Plateau ERU in Washington. Sites that are particularly susceptible to invasion include floodplains, seasonally-wet habitats, and portions of the wheatgrass bunchgrass cover type that are mesic enough to permit growth of Basin wildrye.

Scotch thistle (*Onopordum acanthium*)

The distribution of Scotch thistle includes portions of all ERUs except the Upper Clark Fork. Areas of great prevalence are in the Blue Mountains and Owyhee Uplands ERUs, particularly within the Snake River System and its tributaries (for example, Grande Ronde, Powder, Burnt, and Malheur Rivers). Scotch thistle appears to be expanding its distribution northward, from Oregon into southeast Washington. Cover types that are of particular susceptibility to invasion include riparian types (cottonwood/willow, herbaceous wetlands, and shrub wetlands) and agricultural (cropland/hay/pasture). These cover types are rated of moderate susceptibility to invasion in table 3.174.

Spotted knapweed (*Centaurea maculosa*)

The distribution of spotted knapweed is ubiquitous at the ERU scale, and nearly ubiquitous at the county scale. Areas of great prevalence lie within the Northern Glaciated Mountains, Lower Clark Fork, Upper Clark Fork, and Central Idaho Mountains ERUs in western Montana and northern Idaho. Cover types that are of high susceptibility to invasion and support spotted knapweed populations in the aforementioned ERUs include grasslands (fescue-bunchgrass and wheatgrass bunchgrass), riparian types (cottonwood/willow, herbaceous wetlands, and shrub wetlands) and dry forest types (interior ponderosa pine and interior Douglas-fir) (table 3.174). The areal extent of these highly susceptible cover types within the 30-to-76-centimeters precipitation zone of spotted knapweed is portrayed spatially in map 3.35. In descending order of extent (percent of ERU), ERUs with greater than or equal to 20 percent extent of lands of high susceptibility to invasion by spotted knapweed are: Upper Klamath (56%), Blue Mountains (48%), Upper Clark Fork (39%), Columbia Plateau (35%), Northern Glaciated Mountains and Southern Cascades (33% each), Snake Headwaters (31%), Northern Cascades (27%), Upper Snake (25%), and Central Idaho Mountains (22%) (map 3.35).

Susceptibility of broad-scale cover types:

salient findings—Broad-scale cover types in the Basin vary considerably in their susceptibility to invasion by the 25 focal exotic plant species. Some salient findings are discussed below:

- 1) Based on the number of species that show an affinity for specific cover types (that is, the plant is labeled “invader” or “colonizer” in table 3.174), the exotic forbs/annual grass cover type is the most susceptible to invasion by exotic plants; all 25 exotic plant species show some affinity for this cover type.
- 2) Except for the exotic forbs/annual grass cover type, the grassland cover types (particularly fescue-bunchgrass, herbaceous wetlands, and wheatgrass bunchgrass) are the most susceptible to invasion by exotic plants. We base this finding on the large number of exotic plants labeled “invaders” in the grassland cover types (table 3.174).
- 3) High-elevation cover types, particularly alpine tundra, whitebark pine/subalpine larch, and whitebark pine, are the least susceptible to invasion by exotic plants. We base this finding on the small number (between 4 and 6) of exotic plants labeled “colonizers” or “invaders” in these high-elevation cover types.
- 4) Moist and shady forested cover types with meager light intensity in the understory (for example, grand fir/white fir, limber pine, lodgepole pine, mountain hemlock, Pacific ponderosa pine, Pacific silver fir/mountain hemlock, red fir, and western white pine) appear to be less susceptible to invasion by exotic plants than are drier, open-canopied forested cover types with greater light intensities in the understory, (for example, interior Douglas-fir and interior ponderosa pine). We base this finding on the lower number (zero) of exotic plants labeled “invaders” in the moist and shady forested cover types compared with the drier, open-canopied forested cover types (number of invaders equaled 4 to 6). Engelmann spruce/subalpine fir and western redcedar/western hemlock cover types are exceptions to this finding, as the number of invaders for these moist forest cover types equaled the drier, open-canopied forested cover types (table 3.174).
- 5) Extremely arid cover types are less susceptible to invasion by exotic plants. For example, of all the rangeland cover types, salt desert shrub is the most arid and is also one of the least susceptible to exotic plant invasion. We base this finding on the low number (nine) of exotic plants labeled “invaders” or “colonizers” in salt desert shrub cover type (table 3.174).

The five previously-mentioned findings are in agreement with Baker (1986) and Forcella and Harvey (1983). Grasslands, riparian areas, and some relatively open forests are more susceptible to invasion by exotic plants than are dense forests, high montane ecosystems, and deserts. The former have frequent gaps in the natural plant cover, which provide favorable microsites for exotic plant establishment; whereas, the latter are characterized by relatively closed vegetation or climatic stresses, which are tolerated by only a few exotic plant species.

While there are relatively few exotic plants categorized as invaders in forested cover types within the Basin, there are numerous exotic plants categorized as colonizers. Basin-wide, invasion by these colonizers into forested cover types appears to be dependent on harvest or road-building activities, which create gaps in forest vegetation and thereby provide microsites for establishment, and ample sunlight. The colonizers are restricted primarily to the gaps. Successional processes within the gaps that result in forest canopy cover eventually shade out the exotic plants and reduce their extent. The lack of exotic plants categorized as invaders in forested cover types within the Basin is probably attributable to this same shade-intolerance effect.

- 6) Some exotic plants show no affinity to many cover types in the Basin. These include riparian-obligate species (such as purple loosestrife), and other species (such as orange and yellow hawkweed) that show affinity to montane forest and herbaceous cover types at high elevation. We base this finding on the high number of cover types labeled low susceptibility to invasion by these species (table 3.174).
- 7) Some exotic plants (particularly Mediterranean sage, Scotch thistle, and oxeye daisy) have not been investigated extensively, so rating susceptibility to invasion by those species was not possible for many cover types. There are numerous reasons for this lack of information, including (1) exotic plant herbarium mount labels generally do not include associated species found at the collection site, therefore

cover type cannot be determined for that site; (2) ecological requirements of the exotic plant are not available in the literature; (3) lack of distribution records; and (4) the probability of obtaining distribution records for the exotic plant within a cover type is prevented or restricted because the areal extent of that cover type within the Basin is very small.

Use and limitations of the Susceptibility to Invasion Index—The Susceptibility to Invasion Index is a first approximation of the susceptibility of broad-scale cover types in the Basin to invasion by exotic plants. The accuracy of the susceptibility to invasion ratings will be improved by additional observation and research. There is, in our estimation, a preponderance of “moderate” ratings in the Index (that is, a high quantity of species labeled colonizers). We propose that additional observation and research will change many “moderate” ratings to “high” or “low” ratings. The preponderance of “moderate” ratings is a consequence of the liberal manner in which susceptibility to invasion was rated (see the “Rangeland Ecology and Grazing Management” subsection of the “Overview of Methods” section of this chapter).

A specific example of the liberal manner in which susceptibility to invasion was rated is halogeton. Halogeton is restricted primarily to xeric rangeland cover types that receive less than 30 centimeters of annual precipitation. According to the Index, halogeton shows some affinity (is categorized as either an invader or colonizer) for 68 percent of the cover types. We speculate that a more realistic appraisal would decrease halogeton affinity to the big sagebrush, cropland/hay/pasture, exotic forbs/annual grass, low sagebrush, and salt desert shrub cover types, which represent about 13 percent of the cover types.

The susceptibility to invasion ratings should be interpreted to be “generally adequate” as a broad-scale characterization of the invasive potential of exotic plants to Basin cover types. Fine-scale observations will generate many exceptions to the broad-scale ratings in the Susceptibility to Invasion Index. Fine-scale observation and

research that can be extrapolated to the broad-scale would be informative and useful to improve the Index. We can surmise many exceptions: for example, an exotic plant species might act as an invader in a cover type in one or several ERUs in the Basin, yet that plant might act as a colonizer in the same cover type in other ERU(s) within the Basin. Thus, the susceptibility to invasion rating of the cover type to that exotic plant would be high in some ERUs and moderate in other ERUs. Exotic plants adapt and changes are inevitable.

We did not locate exotic plant inventories that were compiled at the Basin scale. Finer-scale exotic plant inventories (for example, BLM Districts, National Forests, and counties) could be compiled and summarized at the Basin scale, however. These finer-scale inventories would provide some exotic plant information for the Basin, but would be incomplete in their coverage of the landscape; not every unit of land has been searched for exotic plant presence. A great effort was expended in Karl and others (1995) to portray “reasonably” accurate distributions of 25 exotic plants, widely accepted by exotic plant experts as problematic, at the county scale within the Basin. Therefore, the actual extent and distribution of most exotic plants found within the Basin, even at the broadscale, is poorly known.

The Susceptibility to Invasion Index permits land managers to assess which cover types are most at risk of invasion by exotic plant species. The Index can be spatially portrayed to provide a regional visualization of risk of invasion. A link of the Index with other broad-scale attributes, for example precipitation (as shown for four exotic plants in maps 3.26, 3.27, 3.35, and 3.37) can provide more accurate regional visualizations of risk to invasion. The extent of the susceptible cover types (or lands characterized by many variables associated with exotic plant presence) to a specific exotic plant can be compiled for various land units. The Susceptibility to Invasion Index will continue to improve if locality records for exotic plants include information on associated plant species, which would provide a link between

the exotic plant and a cover type. Improvement in the Index will enhance our ability to predict risk of invasion, assess where loss of biodiversity is at greatest risk, and assess where risk to succession/disturbance regime alterations is greatest.

New invaders: problematic exotic plants of the future in the Basin—Several exotic plants in the Basin are localized in distribution at present. Because similar and suitable habitat can be found within the Basin, exotic plant experts suspect that exotic plants that presently exist outside of the Basin will soon establish within it. These exotic plants represent new, or potentially new, invaders to the Basin. We discuss the distribution and other characteristics of nine of these exotic plants. These nine species are regarded as potentially problematic, invasive species in the Basin (see Karl and others 1995 for literature sources pertaining to these species), but do not represent an all-inclusive list of potential problematic invaders in the Basin.

Syrian bean-caper (*Zygophyllum fabago*)

This perennial, bush-like species has been legally declared noxious in Washington and Idaho. In Washington, Syrian bean-caper exists in Adams, Grant, Okanogan, and Whitman Counties. In Idaho, Syrian bean-caper exists near the town of Aberdeen in Bingham County. Oregon has not yet reported the presence of this species, and little is known about its potential to establish or be problematic in Oregon.⁸ All infestations in California have been eradicated. It appears that Syrian bean-caper shows potential for spread into waste places, PVTs in the dry grass PVG, and desert areas (probably equivalent to our PVTs in the dry shrub PVG); these are its native habitats in southwest Asia. Rice and Rider (1995) collected 13 distribution records for this species and proposed that Syrian bean-caper is a colonizer of the fescue-bunchgrass cover type.

⁸ Personal communication. 1995. Dennis Isaacson, Field Operations Manager, Oregon Department of Agriculture, 635 Capital Street NE, Salem, OR 97310-0110.

African rue (*Peganum harmala*)

This perennial, succulent forb has been legally declared noxious in Washington. During the current period, African rue existed in the Columbia Plateau ERU in Grant County, Washington; at present (1995), it also exists in the Columbia Plateau ERU in Crook County, Oregon. African rue is native to the desert shrublands of northern Africa and the Middle East, as far east as Tibet. Its potential to spread within the Basin is unknown. African rue has been known to displace native rangeland plant species in the southwest United States, and can establish in areas receiving less than 25 centimeters of annual precipitation.

Iberian starthistle and purple starthistle (*Centaurea iberica*, *C. calcitrapa*)

These two biennial forbs are nearly indistinguishable and have been legally declared noxious in Oregon (both) and Washington (purple starthistle only). In Oregon, this species complex has been reported within the Columbia Plateau ERU from Sherman and Wasco Counties. In Washington, it has been reported within the Columbia Plateau (Walla Walla County) and Blue Mountains (Asotin County) ERUs. Both species are problematic in California. Purple starthistle also exists in Utah and Wyoming.

Distaff thistle (*Carthamus lanatus*)

This annual forb has been legally declared noxious in Oregon, and during the current period, existed outside the Basin in Douglas County, Oregon. This species has established and is problematic in California and is believed by weed experts to be adapted to the Basin. Its potential for spread into the Basin appears to be greatest in areas that receive between 40 and 61 centimeters of annual precipitation.

Camelthorn (*Alhagi pseudalhagi*)

This perennial shrub species has been legally declared noxious in Oregon and Washington. At present, camelthorn is not believed to exist in Oregon, but does exist in Washington. Camelthorn is problematic in California, where it is subjected to intensive control.

Saltcedar (*Tamarix ramosissima*)

This shrub or small tree species is legally declared noxious in Washington, where at present, populations are known to exist on approximately 140 hectares along the Columbia River in the Columbia Plateau ERU in Grant and Franklin Counties. Small populations also exist scattered along the Bruneau River in the Owyhee Uplands ERU of Idaho.⁹ Saltcedar has established on many riparian areas in the western United States, and has the potential to establish in riparian areas across most of the Basin.¹⁰ Saltcedar displaces native riparian plants, including willow and cottonwood, and we speculate that the cottonwood/willow cover type is of high susceptibility to invasion by saltcedar.

Matgrass (*Nardus stricta*)

This perennial grass is legally declared noxious in Oregon and Idaho. In Oregon, matgrass exists in the Upper Klamath ERU in western Klamath County. Matgrass appears problematic in areas that have been subjected to excessive livestock grazing pressure. Its present rate of expansion is slow. Rice and Rider (1995) collected three distribution records for this species and proposed it to be a colonizer of the wheatgrass bunchgrass and fescue-bunchgrass cover types.

⁹ Personal communication. 1996. Roger Rosentreter, Botanist, U.S. Department of Interior, Bureau of Land Management, Idaho State Office, 1387 South Vennell Way, Boise, ID 83709.

¹⁰ Personal communication. 1995. Dennis Isaacson, Field Operations Manager, Oregon Department of Agriculture, 635 Capital Street NE, Salem, OR 97310-0110.

Squarrose knapweed (*Centaurea virgata*)

This perennial forb is legally declared noxious in Oregon. In Oregon, squarrose knapweed exists in the Blue Mountains and Owyhee Uplands ERUs in Union, Grant, Wheeler, and Malheur Counties. Its extent in Oregon in 1990 was reported as 320 hectares, none of which existed on BLM- and FS-administered lands. Squarrose knapweed exists in Utah, outside the Basin, on rangeland that receives only 15 to 20 centimeters of annual precipitation. It has yet to be reported from Washington and Idaho, but Roche and Burrill (1992) suspect it is present in southern Idaho.

Ventenata (*Ventenata dubia*)

This annual graminoid is not legally declared noxious in the Basin. It is a relatively recent (the last 40 years) invader to the Basin. Ventenata is now distributed in the western foothills of the Blue Mountains in the Blue Mountains ERU; the canyon grasslands of west-central Idaho in the Blue Mountains, Columbia Plateau, and Central Idaho Mountains ERUs; and in southeast Oregon in the Owyhee Uplands ERU (Hironaka 1994, Karl 1996¹¹, Larson and Sheley 1994, Northam and Callihan 1994, Tisdale 1986). Based on Karl's (1996)¹¹ observations ventenata appears to be an invader in the wheatgrass bunchgrass and fescue-bunchgrass cover types, and is displacing cheatgrass in the foothills of the Blue Mountains. Northam and Callihan (1994) report that ventenata appears to be displacing medusahead as well.

¹¹ Personal observations. 1996. Michael G. "Sherm" Karl, Rangeland Management Specialist-Ecologist, U.S. Department of Agriculture, Forest Service, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

Cheatgrass

This subsection is a summarization of Pellant (1996). Most of the literature cited in this subsection originates from Pellant (1996).

Ecology—Cheatgrass is an annual grass that was introduced to the Basin region from Europe in the late 1880s probably via contaminated grain (Mack 1981, Mack and Pyke 1983). By 1930, cheatgrass had already attained its current distributional range among the western states of the United States (Mack 1981). In 1995, cheatgrass existed in every county within the Basin (Karl and others 1995).

Cheatgrass has several characteristics that enhance its establishment in native plant communities, particularly those communities that are under stress or have been disturbed. These characteristics include high seed production (Hulbert 1955); ability to germinate in the autumn or spring; greater germinability in comparison with native grasses (Mack and Pyke 1983, Martens and others 1994); tolerance to grazing; and population expansion attributable to frequent fire regimes (Klemmedson and Smith 1964). Standing dead cheatgrass and litter produced by cheatgrass is extremely flammable and results in a shorter fire-return interval compared with the fire-return interval characteristic of the pre-Euro-American settlement period (Billings 1948). Native sagebrush communities had fire-return intervals of 32 to 70 years (Wright and others 1979), while current period sagebrush communities have return-fire intervals of five years or less, particularly on cheatgrass-dominated, southern Idaho rangelands in the Owyhee Uplands ERU (Pellant 1990). This scenario is referred to by Pellant (1996) as the cheatgrass-wildfire cycle. As a result of shorter fire-return intervals, the extent of big game winter range in the Great Basin has declined (Pellant 1990, Updike and others 1990); habitat supporting the densest concentration of nesting raptors in North America has declined (Kochert and Pellant 1986); the persistence of some native plant species is threatened (Rosentreter 1994); non-game bird abundance has declined (Dobler

1994); native plant species richness has been reduced at all landscape scales; and successional recovery periods have been extended (Billings 1994, Whisenant 1990). Cheatgrass plants in post-fire environments are adapted to appropriate nutrients and soil water more efficiently than native plants. The cheatgrass-wildfire cycle presents the greatest risk to the Wyoming big sagebrush component of the big sagebrush cover type, and the more mesic sites within the salt desert shrub cover type (Pellant 1990, Peters and Bunting 1994).

Cheatgrass has adapted to many plant communities, from low-elevation salt-desert shrub communities (Sparks and others 1990, Young and Tipton 1990) to higher elevation ponderosa pine communities (Daubenmire 1952). These communities exist at elevations ranging from approximately 450 to 2,745 meters, where the annual average precipitation ranges between 15.2 and 56.0 centimeters (Bradley 1986). The adaptability of cheatgrass can be attributed in part to the genetic variability of its populations. This genetic variability has contributed to the evolution of ecotypes that are adapted to different environments (Novak 1994).

Cheatgrass completes its life cycle relatively early in the growing season, typically by June. Cheatgrass photosynthesis essentially is completed by this time, whereas in most native plant communities there exists an assemblage of plants that continue to photosynthesize later in the growing season. In cheatgrass-dominated communities then, the duration of photosynthesis, and therefore energy flow, is truncated. In addition, a consequence of the relatively early senescence of cheatgrass is a considerably shorter period of palatability and nutrition for herbivores, compared with many native herbaceous species (Klemmedson and Smith 1964).

Although the growth period for cheatgrass is truncated compared with many native perennial species, cheatgrass can occasionally produce more annual biomass than can native vegetation, or introduced seeded wheatgrass species (Hull and Pechanec 1947). However, cheatgrass production

varies greatly from year to year (Klemmedson and Smith 1964, Stewart and Young 1939). This variability in annual production necessitates variable livestock stocking rates.

Cheatgrass typically provides adequate soil surface cover for watershed protection. However, in drought years and after wildfires, cheatgrass production can be inadequate to provide soil surface cover suitable for watershed protection. This is especially evident on sites with soils susceptible to water and wind erosion, and on sites with moderate to steep slopes. Under these circumstances, the potential for erosion is greater.

The ecological relationships between cheatgrass and microbiotic crusts are not understood completely. Where intact, microbiotic crusts apparently can restrict cheatgrass establishment (Kaltenecker and Wicklow-Howard 1994). Microbiotic crust development appears to be restricted within cheatgrass-dominated plant communities, in comparison with native sagebrush communities (Pellant and Kaltenecker 1996¹²). Subsequent to burning, cheatgrass can rapidly dominate sites, and hinder the recovery of microbiotic crust species. The lack of microbiotic crust development and microbiotic crust species richness might have negative implications in nutrient cycling, native plant succession, site stability, and exotic species invasion, such as cheatgrass.

The cheatgrass-wildfire cycle has indirectly resulted in a reduction of native plant species richness because of the common practice of planting introduced wheatgrasses, primarily crested wheatgrass, after wildfires. Post-wildfire seeding with seed mixtures composed primarily of crested wheatgrass was a common practice to prevent cheatgrass dominance after wildfires and to provide livestock forage from the 1950s to the 1970s. This practice has continued to a certain

¹² Mike Pellant and Julie Kaltenecker. 1996. Unpublished research data on cheatgrass and microbiotic crust. Mike Pellant, Rangeland Ecologist, U.S. Department of Interior, Bureau of Land Management, Idaho State Office, 1387 South Vennell Way, Boise, ID 83709.

extent into the current period (Pellant and Monsen 1993). Although seedings have reduced the extent of cheatgrass monocultures on the landscape, seedings of perennial grasses tend to perpetuate reduced levels of native plant species richness. However, seedings of perennial grasses more closely resemble the structure and disturbance regimes of native communities compared with cheatgrass monocultures. Recent trends toward the use of seed mixtures containing native species might ameliorate the reduction of native plant species richness (Pellant and Monsen 1993) and further approximate species compositions and disturbance regimes of native communities.

Cheatgrass thresholds: a potentially useful concept in determining risk to rangeland health—In the subsection “Herbivory by large herbivores”, we introduced the concept of thresholds and state-and-transition models for vegetation succession. Cheatgrass-dominated areas were used as an example of an apparently stable vegetation state that had crossed a threshold. Therefore, removal of livestock grazing pressure would not definitively be an impetus for movement of this stable state to a more advanced, higher successional state. In the context of rangeland health, which is defined as “the degree to which the integrity of the soil and the ecological processes of rangeland ecosystems are sustained” (National Research Council 1994), cheatgrass-infested sites that have crossed a threshold represent sites where ecological processes (for example, succession, energy flow, nutrient cycling) have been disrupted, and soil instability is apparent. Therefore, rangeland health is at risk on sites where cheatgrass, measured by density for example, approaches or crosses a threshold.

Unfortunately, science has yet to provide definitive thresholds for cheatgrass. There would not be only one ubiquitous threshold density for cheatgrass; threshold densities could vary depending on ecological site, climatic conditions, management activities, disturbance regimes, and plant composition. In addition, science has yet to provide definitive ratios of cheatgrass to native plants that do not represent a risk to rangeland health (that is,

densities of cheatgrass that are not yet impairing ecosystem processes and soil integrity). Speculation at present is that cheatgrass densities below approximately 40 to 50 per square meter might not negatively affect recruitment of native plants. A density of three plants per square meter for crested wheatgrass has been proposed as adequate for maintaining perennial vegetation in low elevation sagebrush communities (Evans and Young 1977), whereas 2.5 plants per square meter for native perennial species has been proposed as adequate to prevent cheatgrass dominance on sites where the shrub structure has been removed (Evans and Young 1978). The determination of threshold densities for cheatgrass and native perennial plants, and associated risk to rangeland health, is more an art than a science at present.

Cheatgrass control—The concept of a cheatgrass threshold can be used as a benchmark for management decisions regarding cheatgrass control (reduction in cheatgrass abundance). For example, if a cheatgrass threshold is crossed, scientific evidence suggests that intervention through artificial reseeding might be the only recourse for establishment of native or introduced perennial plant communities. Prior to artificial reseeding, cheatgrass must be controlled (Evans and Young 1977, Hull and Stewart 1948, Jordan 1983). If a cheatgrass threshold has yet to be crossed, techniques have been tested and are becoming available that control cheatgrass with the objective of releasing resident perennial plants from the competitiveness of cheatgrass.

Techniques including mechanical (disking or plowing), burning, grazing, herbicides, and biological control have been applied to control cheatgrass. These techniques vary in their effectiveness depending on factors including the phenological stage of cheatgrass at the time of application, pre- and post-application climatic conditions, and soil water.

Mechanical techniques, to be effective in cheatgrass control, must bury cheatgrass seed to a minimum depth of 6 centimeters (Hulbert 1955) to prevent the emergence of cheatgrass seedlings. Plowing,

especially using a moldboard plow, has proven to be an effective cheatgrass control technique. Plowing or disking are most effective when applied before cheatgrass seedripeness, or after fall germination of cheatgrass seeds. Rocky soils limit the use of this technique.

Burning, particularly in the late spring before cheatgrass seed dissemination, can be an effective control technique (Pellant 1990, Stark and others 1946). Burning can result in substantial reductions in cheatgrass densities the year after the burn (Pechanec and Hull 1945, Stewart and Hull 1949). Although cheatgrass densities are reduced in burned areas the year after the burn, reproductive inflorescence production and seed production per cheatgrass plant in burned areas are greater than for cheatgrass plants in unburned areas. In addition, seeds on the soil surface and in the seed bank can survive burning, which permits recovery of the cheatgrass stand in just a few years after the fire event, unless reseeding with perennial grasses was successful. Thus, burning can control cheatgrass but does not eradicate it.

In general, livestock grazing is not an effective control technique for cheatgrass (Vallentine and Stevens 1994). Although cheatgrass production of seeds and biomass can be reduced with livestock grazing, benefits to remnant native perennial species typically will not accrue. Livestock grazing pressure that results in the control of cheatgrass also typically results in comparatively greater deleterious effects to remaining native plants in the community (Young and Tipton 1990, in Vallentine and Stevens 1994) because they are consumed concomitantly with the cheatgrass. However, excessive livestock grazing pressure that is intentionally applied to cheatgrass can (1) prepare sites for artificial seeding of perennial species, (2) decrease cheatgrass fine-fuel production, and (3) lengthen fire-return intervals.

The use of herbicides is an effective technique for control of cheatgrass, although herbicides are costly to approve and apply. An atrazine-based, chemical fallow weed control technique was developed by Eckert and others (1974) to control

cheatgrass preceding the seeding of perennial wheatgrasses for revegetation. Since the 1970s, environmental constraints have limited the use of herbicides for control of cheatgrass on public lands (for example, atrazine is no longer registered for use on rangeland; Ogg 1994). As a consequence of the *Final Environmental Impact Statement for Vegetation Treatment on BLM Lands in Thirteen Western States* (U.S. Department of Interior 1991), 21 herbicides were approved for use in control of various weed species, including cheatgrass. One herbicide in particular, sulfometuron-methyl, has proven to be effective in controlling cheatgrass in southern Idaho, without a concomitant deleterious effect on most perennial native plants. Other herbicides registered for control of cheatgrass are presented in Ogg (1994). Not all of these herbicides have been approved for use on public lands.

Biological control of cheatgrass on extensive acreages of rangeland is not yet practiced. Some bacterial species have proven effective in controlling cheatgrass in an agricultural setting (Kennedy 1994); thus, Kennedy (1994) speculates that there is potential for control of cheatgrass on rangelands with bacteria. The hypothesis stimulating research into bacterial control agents is that plant-suppressive bacteria can be used to suppress the growth of unwanted plant species growing in association with more desirable plant species.

Perennial plant revegetation—The revegetation with perennial plants of communities that were previously infested with cheatgrass was a research and management priority in the Great Basin beginning in the 1930s and the 1940s (Hull and Pechanec 1947, Piemeisel 1932). This and subsequent research conducted in southern Idaho (Hull 1974, Hull and Holmgren 1964, Hull and Stewart 1948) have provided strong evidence that introduced wheatgrasses, especially crested wheatgrass, are superior to native grasses in establishing and persisting in communities previously infested with cheatgrass. The reduction in native plant species richness that tends to be perpetuated with seedings of these introduced grasses has been mentioned previously in this subsection and is the crux of the

controversy surrounding the use of exotic plants to revegetate rangeland communities infested with cheatgrass. Recent seeding practices implemented by the BLM incorporate the use of native species in seeding mixtures; this trend toward the use of native species is becoming more prevalent (Pellant and Monsen 1993).

Greenstripping—A proactive technique to reduce the magnitude of the cheatgrass-wildfire cycle is to seed strips of fire-resistant vegetation (otherwise referred to as a “greenstrip”) at strategic locations, in order to slow or stop the spread of wildfires (Pellant 1990). Pellant (1994) describes various criteria to consider when planning a greenstrip project for wildfire reduction. Site preparation and the correct selection of plant materials are essential for the establishment of a functional greenstrip. Herbaceous plant species commonly used in greenstrips include introduced wheatgrasses (for example crested wheatgrass), Russian wildrye (*Elymus junceus*), dryland alfalfa (*Medicago* sp.), Lewis flax (*Linum lewisii*), and small burnet (*Sanguisorba minor*) (Pellant 1994). Greenstripping is not a solution to the cheatgrass-wildfire cycle. However, greenstripping can aid in reducing the size and frequency of wildfires. The ecological benefits to greenstripping include conservation of native plant species richness and shrub cover on fire-prone landscapes, and the eventual enhancement of native plant species richness (West 1979, Whisenant 1990, Young and Evans 1978).

The future—Cheatgrass will remain a component of many PVGs in the Basin. The distribution and dominance of cheatgrass continues to expand, particularly within the dry forest, dry shrub, and dry grass PVGs. Although cheatgrass tends to form a stable vegetation state after establishment, attributable to frequent fire, other exotic plants are invading cheatgrass-dominated communities and potentially degrading rangeland health even further. Examples of these other exotic plants include medusahead, yellow starthistle, and ventenata. Ventenata is a relatively recent (during the last 40 years) exotic annual grass invader that is distributed in the western foothills of the Blue Mountains in the Blue Mountains ERU; the canyon grasslands

of west-central Idaho in the Blue Mountains, Columbia Plateau, and Central Idaho Mountains ERUs; and in southeast Oregon in the Owyhee Uplands ERU (Hironaka 1994, Karl 1996¹³, Larson and Sheley 1994, Northam and Callihan 1994, Tisdale 1986).

Research focused on integrating weed control techniques for control of cheatgrass and other exotic plant species will become more prevalent in the future. Integrated weed management incorporates combinations of techniques that might act synergistically to permit more effective control of weed species. Two examples of integrated weed control techniques for cheatgrass are (1) biological control agents [for example, rhizobacteria (bacteria active in root tissue)] combined with herbicides (Kennedy 1994), and (2) burning or livestock grazing, combined with herbicides.

Microbiotic Crusts: A Rangeland Landscape Element of Concern

This subsection is a summary of Leonard and others (1995), which is an ICBEMP report focusing on the ecological roles and implications of microbiotic crusts for rangeland management. Leonard and others (1995) is based primarily on two other ICBEMP reports, Kaltenecker and Wicklow-Howard (1994) and Williams (1994), and secondarily on other literature sources.

Microbiotic crusts consist of lichens, bryophytes, algae, microfungi, cyanobacteria, and bacteria growing on or just below the soil surface (Eldridge and Greene 1994). Microbiotic crusts play a role in nutrient cycling, soil stability and soil moisture, and interactions with vascular plants. Microphytic plants provide forage for invertebrates, and some lichens growing on or near the soil surface such as vagrant (non-attached) lichens, provide forage for big game species during critical winter periods

¹³ Personal observation. 1996. Michael G. “Sherm” Karl, Rangeland Management Specialist-Ecologist, U.S. Department of Agriculture, Forest Service, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

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Flood-borne Noxious Weeds: Impacts on Riparian Areas and Wetlands

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Introduction

Native riparian ecosystems, especially in the West and Southwest, are disappearing rapidly. Riparian areas, the vegetated areas adjacent to a stream, or other body of water, serve multiple functions in water quality protection, flood control and storm damage prevention, biodiversity, habitat, and recreation. Over half of the wetland and riparian zones have been destroyed in the coterminous 48 states, and few of the remaining zones have not been adversely impacted (Fredrickson and Reid 1986).

The United States Department of Interior (USDI) Bureau of Land Management has estimated that noxious weeds are consuming 4600 acres a day on western public lands. Impacts and costs of this rapid weed invasion include reduced crop yields, loss of forage for grazing livestock, costs incurred for roadside weed control, reduction of property values, degraded water quality, degradation of fisheries, and impairment of recreation availability.

In Nevada, riparian areas represent a tiny fraction of the total land area, but have greater quantity and diversity of plant species than adjoining land. Riparian areas often include wetlands that provide important habitat for Nevada's fish and wildlife. While wetlands cover less than 1 percent of Nevada, they are some of the most economically and ecologically valuable lands in the state (Lico 1994).

Economic benefits of riparian areas, such as recreational activities, are abundant, and include hunting, fishing, boating, bird watching, photography, and camping. The lush vegetation growing in wetlands and surrounding areas provides quality forage for grazing of cattle or sheep as well as a water supply. Undeveloped floodplains also play a critical role in storm damage prevention and flood control.

Many of these benefits can be traced to the functions of vegetation in riparian areas. This paper will explore the role of riparian vegetation and the relationship of flood events to the invasion and proliferation of four noxious weeds.

Benefits of Riparian Vegetation

Riparian vegetation includes species adapted to varying degrees of inundation and groundwater depth. This vegetation serves multiple functions, including flood control and storm damage control, fish and wildlife habitat, and pollution prevention. Proper functioning of riparian areas depends upon maintaining a diverse population of natural vegetation that occupies most of the niches and consumes most of the resources (Sheley et al. 1996). Such dense vegetation thus reduces the relative competitive ability of weeds at the site.

Flood control and storm damage prevention

Rivers and streams are constantly changing in response to changes in flow volumes and changes in land use. Naturally vegetated riparian areas, including floodplains, serve a number of beneficial functions for flood control. When floodplains are maintained in an undeveloped condition, they reduce the force, height and volume of floodwaters by providing space for the waters to spread out horizontally and relatively harmlessly across the floodplain.

Vegetation along the streambank provides friction against moving water. Increased roughness from vegetation causes energy loss which decreases sediment erosion and transport. The vegetation itself provides resistance to streambank erosion by binding the soil with dense networks of roots. Smith (1976) found that the

bank erosion rate decreases significantly as the percentage by weight of vegetative roots in a sample increases. In root-free silt, an erosion rate of 160 cm/h occurred, whereas with 16-18% of roots and 5 cm of root 'rip-rap' the rate was 0.02 cm/h (Richards 1982). Figure 1 demonstrates the relationship of erosion to plant cover and soil type.

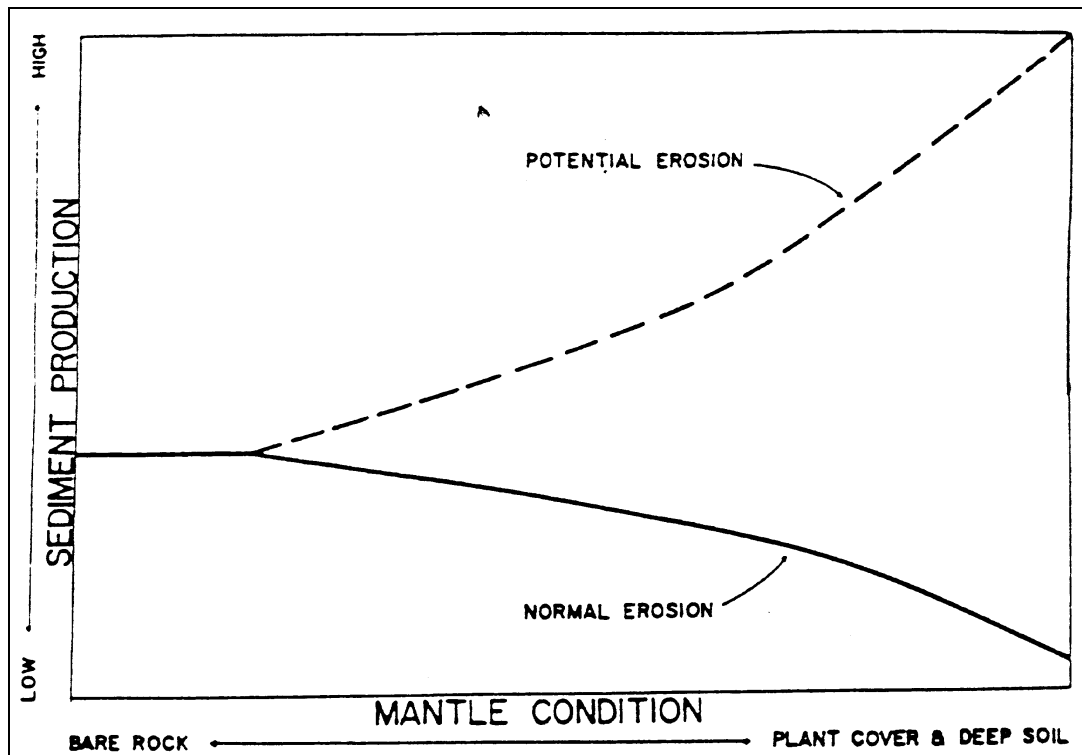


Fig. 1. The decrease in normal erosion that accompanies the protective influence of vegetation (from Branson et al. 1972)

Floodplains are often referred to as nature's "sponge." The extensive root system of riparian vegetation helps keep pores open in the soil, allowing two to three times more water to infiltrate the soil compared to cultivated or grazed lands. It has been estimated that some sedges have an average of more than 100 feet of roots and rhizomes per cubic inch of soil near the soil surface (Swanson 1988).

Flood attenuation via water retention is one important function of riparian areas and floodplains. Vegetation intercepts and detains runoff from adjacent upland areas that would otherwise flow directly into rivers, creating additional peak flows for downstream areas. The trapped water is slowly released, adding to base flows during dry seasons.

Transpiration by trees, shrubs, and herbaceous plants in riparian areas helps dry soils. It has been estimated that as much as several thousand gallons per acre of water are used by plants each day, helping to reduce peak flows and flooding downstream (Cohen 1997a).

Fish and Wildlife Habitat

Wildlife use riparian areas more than any other single habitat (Swanson 1986). In Nevada, riparian wetlands and large marshes provide stopover and breeding grounds for migratory waterfowl. Many of Nevada's threatened and endangered species inhabit wetlands. Wetlands also provide primary productivity for aquatic and terrestrial food webs. These high-value areas provide browse and water for a variety of animals, and more than half the vertebrates living on rangeland need riparian areas or use them for some critical period of their life. Riparian areas also provide critical connective corridors allowing wildlife movement from one area to another.

Vegetation plays a key role in the function of riparian areas as wildlife habitat. Streamside vegetation provides food and shelter for many species. The shade, litter and woody debris provided by riparian vegetation are important for healthy fisheries, which in turn are a key food source for many wildlife species. The riparian tree canopy helps to moderate water temperatures, helping to maintain the relatively high levels of dissolved oxygen needed by trout and other aquatic organisms. Studies have shown stream temperatures dropping from 80 to 68 degrees after the stream had flowed through 400 feet of shaded channel (Cohen 1997b). Streamside forests can also help insulate streams from excessive freezing. The detritus from decaying leaves, twigs, and plant matter which falls into the stream provides a key energy source that fuels the base of the aquatic food chain. Insects falling from overhanging vegetation provide an important food source for fish.

Failure to maintain vegetative cover on riparian areas adjacent to small streams may result in a significant loss of groundwater recharge and may increase the frequency, duration and severity of low flow conditions. In small streams, this reduction in baseflow can be fatal to fish and other aquatic organisms.

Water Quality Protection

Riparian vegetation and soil serve as water filters, intercepting surface -water runoff before it reaches the stream or river. This filtering process removes and recycles nutrients, processes chemical and organic wastes, and reduces sediment loads reaching streams and rivers.

Sediment is probably the most common and most easily recognized of the nonpoint source pollutants. Sediment suspended in water can reduce or block the penetration of sunlight, adversely affecting the growth and reproduction of beneficial plants. Sediment in the water column irritates the gills of fish and makes them more prone to disease. When deposited on the stream bottom, sediment interferes with feeding and reproduction of bottom dwelling fish and aquatic insects, weakening the food chain. It can also smother fish eggs when deposited on spawning gravels. Large deposits of sediment can decrease channel capacity and increase the potential for flooding.

As mentioned above, riparian vegetation plays an important role in decreasing bank erosion and sedimentation. Riparian vegetation also helps remove sediment by reducing the speed of flow of runoff water, acting as "settling basins". As velocities decrease, suspended particles drop out of the water column. More sediment is filtered out by the vegetation and organic litter on the soil surface. Since about 85% of available phosphorus is adsorbed onto the surface of small soil particles, decreasing sediment results in decreased loads of phosphorus to streams.

Some wetland plants are important in purifying water, especially in removing heavy metals from the water column and accumulating them into plant tissue. Plants such as sedges, duckweeds, bulrushes and cattails are valuable in absorbing and storing large amounts of nitrogen and phosphorus, and are also useful in reducing some pathogenic bacteria. Microbes that live on the surface of plant roots in wetlands remove far more nitrogen than the plants themselves, and also function to transform nitrogen available as nitrate to ammonia, which tends to adsorb to soil particles instead of leaching.

Floods and the Spread of Weeds

Water has long been recognized as a mechanism for the spread of invasive weeds (Zimdahl 1993; Pysek and Prach 1994). Water functions as a "transport habitat" for the dispersal of plant materials. Seed dispersal by water is a major route of spread of weeds in the western United States, especially in areas with irrigated agriculture. Estimates suggest 120,000 seeds/acre/year enter fields from irrigation water. Vegetative propagation of plants is especially well developed in aquatic habitats, and often provides the major reproduction and dispersal mechanism for aquatic weeds (Radosevich et al. 1997).

Floods provide an extreme example of the spread of plant species with water. During large flood events, as water velocities increase as a function of flow volumes, the erosive power of the water increases exponentially as a function of velocity, increasing sediment transport rates. Increased stream power results in changes in channel morphology, including scour, widening, deepening, sandbar formation, filling or relocation of the active channel, alteration of substrate particle sizes, damage to riparian and aquatic vegetation, and the addition or

removal of organisms from the local community (Friedman et al. 1996). This disturbance to the channel provides an opportunity for noxious weeds to colonize in the riparian areas. Flood frequency and intensity are important influences on vegetation zonation. In some regions, flow variability is relatively high, and extreme events can cause long-lasting channel changes which may alter vegetation communities.

Periodic flooding provides disturbances and openings in vegetative cover (Pysek and Prach 1994). Species favored by disturbance and by newly mobilized dissolved nutrients will rapidly fill these niches. Flood flows likewise act to transport seeds and plant parts from existing infestations into previously weed-free areas. Vegetative reproduction is a common trait of perennial weeds, and allows them to colonize readily in a wide range of disturbed habitats (Bhowmik 1997). As flows recede, the plant matter is deposited on newly formed sandbars and in areas which have been stripped clear of riparian vegetation. For many weed species, invasion of riparian areas by seeds follows an exponential curve (Pysek and Prach 1994).

Weeds have many impacts on riparian areas. They often alter water table depths by tapping into previously unused groundwater resources. Many noxious weeds are capable of outcompeting native species by suppressing native recruitment, consuming water and nutrient resources, or by shading slower growing plants.

Studies have shown that weeds often do not stabilize soils as well as native vegetation, which can lead to degradation of the stream channel. Soil and water losses increase when tap-rooted plants replace fibrous root systems. Surface water runoff and soil erosion increased 56% and 192%, respectively, on spotted knapweed dominated sites (Beck 1993). This resulted in decreased water infiltration and increased erosion, and thus, to increased sediment production. Loss of rooting strength results in reduced ability to withstand flood flows, and increased rates of bank and bed erosion.

Flood-borne Noxious Weeds in Nevada's Waterways

Four noxious weed species, including tall whitetop (*Lepidium latifolium*), saltcedar (*Tamarix* spp.), purple loosestrife (*Lythrum salicaria*) and Eurasian watermilfoil (*Myriophyllum spicatum*) are becoming established in previously weed-free reaches of the Truckee River drainage system as a result of flood flows from the January 1997 storm event. These four weeds are found on the CalEPPC List of Exotic Pest Plants of Greatest Ecological Concern in California, with tall whitetop, Eurasian watermilfoil and saltcedar classified as widespread, invasive wildland pest plants, and purple loosestrife considered a species with potential to spread explosively.

These species have in common the ability to reproduce vegetatively, whether by layering (saltcedar), sprouting from roots and crowns (tall whitetop and purple loosestrife) or from floating plant fragments (Eurasian watermilfoil). Their rapid rate of growth allows them to outcompete more desirable riparian vegetation such as cottonwoods, which are normally favored by flood events. This can result in the loss of functional riparian communities, loss of rooting strength and protection against erosion, destruction of habitat for threatened and endangered species, loss of recreation opportunities, and impacts on water quality.

Tall whitetop or perennial pepperweed (*Lepidium latifolium*)

Tall whitetop is native to southeastern Europe and southwestern Asia, and is thought to have been introduced into the United States as a contaminant of sugar beet (*Beta vulgaris* L.) seed near the turn of the century. One of the first infestations in California was traced to such seed imported to Yolo County in the Sacramento Valley (Robbins 1940). It has been reported as a pest in all counties in California except the coastal rain forest of the far northwest and the southeastern lower elevation deserts (Young et al. 1995).

Tall whitetop has been reported in the Truckee River basin for several decades. By 1992, it had colonized 12,000 acres of the lower Truckee River, and many more acres are infested today. It is now found in the Carson and Humboldt River basins, the Lake Tahoe basin, and many other locations statewide.

This weed grows optimally in moist, salty soils and is well adapted to Nevada's alkaline conditions. Spread of this weed is usually by water carrying seed from upstream areas. In Utah, spread of the weed was correlated to extremely high flows on the Green River which caused extensive flooding (Reid et al. 1996). Tall whitetop is a rhizomatous perennial that spreads also by creeping underground rootstocks, and it is a fierce competitor, consuming nutrients and moisture and outgrowing desirable vegetation. Its aggressive colonization leads to the

establishment of monocultures along streambanks, with the accompanying loss of benefits of native riparian vegetation to wildlife habitat, fisheries, recreation, livestock grazing, erosion control, and water quality.

Tall whitetop influences the nature of surface soils through a buildup of decaying organic matter from leaves and stems. Since the weed is adapted to using water containing high levels of salts, the plant biomass contains elevated levels of salts which are then deposited on the soil surface.

When introduced into native hay meadows, tall whitetop lowers the quality of hay in terms of protein content and digestibility, and the accumulation of old dead stems inhibits grazing. In riparian areas and wetlands, these dead tall whitetop stems negatively impact nesting habitat for wildlife, although no one has measured and quantified the impact of the weed on waterfowl habitat. The weed also interferes with mosquito control because of changes in the vegetation canopy.

During the flood of January 1997, a major amount of streambank erosion occurred along the Truckee River. Damage was especially severe in areas dominated by tall whitetop, with wide swaths of bank lost to a depth of 4 feet and more. Despite its extensive root system, tall whitetop affords little protection from erosion due to high velocity flows. The roots break easily at the nodes, and new plants can grow from each fractured node. Research has shown that new plants will grow from fragments as little as 1/10th of an inch in diameter (Wotring et al. 1997).

As flows slowly receded following the flood, plant material carried with floodwaters was deposited on newly formed sandbars, and, by March 1997, had begun to sprout vigorously. In June, during the critical period for cottonwood recruitment, tall whitetop was 6" or taller and was shading the soil surface, which may have affected the survival of the more desirable tree species. No research currently exists to determine the effects of tall whitetop on cottonwood recruitment.

Tall whitetop was also observed growing after the flood in areas which had previously been weed-free, from inundated lots in the Sparks industrial area to rangelands receiving spillage from irrigation ditches. Once tall whitetop has established during a single growing season, it is able to survive and reproduce even in less-than-optimal conditions, including drought.

Saltcedar (*Tamarix* spp.)

Saltcedar or tamarisk (*Tamarix* spp.) is native to Western Europe, the Mediterranean, north Africa, and northeast China and India. These trees were purposefully introduced into the United States in the early 1800s as ornamentals, for windbreaks, and as erosion control. They were initially cultivated for widespread use by the U.S. Department of Agriculture at the National Arboretum in Washington, until it became recognized that the species easily invades and colonizes drainage systems in arid and semi-arid areas. It has been estimated that tamarisk has replaced most of the native vegetation on more than a million acres of riparian lands in the western United States, with another million acres potentially to be lost to tamarisk in the next ten years.

Tamarix species are found on silty soils and alluvial deposits along lakes, rivers, and other wet areas. In Nevada, this phreatophyte is found in the Truckee, Carson, and Walker Rivers (25,000+ acres), and the Humboldt River basin, where it has consumed 20,000+ acres. Natural Resources Conservation Service (NRCS) personnel estimate that more than 60% of the Humboldt Sink is total saltcedar canopy cover.

Saltcedar impacts riparian areas in a number of ways. These plants increase the soil surface salinity by absorbing salts from deeper soil layers and groundwater and transporting these salts to their leaves, subsequently releasing the salts back into the surrounding soils through accumulation in the leaf litter. This high tolerance for salt provides a competitive advantage over native trees and shrubs (DiTomaso 1996), and increasing levels of soil salinity inhibits germination and growth of most other plant species, with the notable exception of tall whitetop.

Saltcedar is a heavy user of water via evapotranspiration. The root system of saltcedar is extensive, and the primary root grows downward until it reaches the water table, at depths of 3 m or deeper (Brotherson and Winkel, 1986). Some studies have indicated that saltcedar uses from 4 to 13 acre feet of water per year (Davison et al. 1995) with 4 to 6 acre feet/year being a common rate of consumption. Saltcedar is able to access groundwater from deep water tables, while many native riparian trees and shrubs can survive only in saturated

soils. When saltcedar replaces native vegetation, it may tap into water sources which were previously untouched, with the end result being a lowered water table in areas dominated by this weedy tree.

Saltcedar is poor forage for livestock and wildlife, but does provide some cover. However, plant diversity is reduced in saltcedar communities compared to native vegetation growing in similar locales (Davison et al. 1995). Wildfires are common in areas with high densities of saltcedar due to the accumulation of leaf litter and woody material. The plant can resprout from its roots after the above-ground vegetation has burned, allowing it to reestablish quickly after fires. This favors the regrowth of saltcedar over more desirable native vegetation.

Saltcedar in river systems is hardy, showing the ability to withstand flooding and submersion in slow moving waters for up to 3 months without detrimental effects (Stevens 1987). Adventitious roots easily develop from submerged or buried saltcedar stems, providing a mechanism for spread during floods. Its seeds will germinate upon direct contact with water, and have been reported to germinate while floating on water (Everitt 1980). Successful seedling establishment appears to depend upon the availability of silt deposits created by flood disturbance (Steven 1987). Ideal conditions for survival include saturated soils for the first two - four weeks following germination, open sunny ground, and the absence of competition, all of which may be found in areas recently disturbed by floods (Everitt 1980). Saltcedar will become established in dry locations that have been temporarily flooded. Once established, saltcedar can survive almost indefinitely in the absence of surface saturation of the soil.

Saltcedar has been implicated in increasing the intensity and frequency of flooding. As stands of saltcedar become dense in a river's floodplain, flood flows are impeded and may inundate areas not normally flooded. The decrease in velocity of water drops out sediment, which can cause channel avulsion. The deposition of sediment results in a narrower channel with lower capacity, increasing the measured flood stage and area of inundation (Blackburn et al 1982).

Many new saltcedar seedlings were noted growing along the Truckee River in September, 1997 in areas disturbed by flooding and areas in which a tall whitetop control project resulted in a decrease in the plant cover. If not controlled, the result will be a large increase in the amount of Truckee River streambank lost to this damaging species.

Purple loosestrife (*Lythrum salicaria*)

Purple loosestrife is an emergent aquatic plant which originally reached North America in the cargo and ballast of ships coming from Europe. The plant subsequently spread to wetlands throughout the northeastern United States by way of canals, irrigation ditches, and roads. The spread and dominance of purple loosestrife in wetlands has shown an exponential increase. By 1900, purple loosestrife had spread to the glacial marshes of the Midwest; by 1940, it had reached the Pacific Northwest; and by 1985, Alaska and Montana were the only states north of the 35th parallel not reporting this weed (Thompson et al. 1987). This showy plant became a favorite of horticulturalists, who aided in its spread. Likewise, its value as honeybee forage has expanded its range.

Loosestrife is an aggressive perennial which invades and degrades wetland habitats, growing from three to eight feet tall. It is easiest to identify when in full bloom in July and August. It can form dense, impenetrable, long-lived stands which are poor habitat for many native wetland animals. Connected waterway systems are at risk for invasion throughout the entire network.

The weed grows well on disturbed, moist soils, and is thus favored by flood flows. Reproduction occurs via seeds (up to 2.7 million seeds per plant annually), by underground roots, and by resprouting from roots and broken stems. The tiny seeds are readily carried by water, wind, and animals, and must lodge on open, moist soil or saturated organic debris to root. The plant is more successful on slightly acid or neutral soils, but will grow on a wide variety of soils.

Wetlands are harmed when loosestrife crowds out native plants such as cattail and bulrush, replacing more than 50% of the biomass of some wetland communities (Thompson et al. 1987). The weed provides neither food sources nor shelter for most wetland wildlife. It also occludes channels, increasing siltation and decreasing channel capacity, increasing maintenance needs. The plant is also a problem in wetland pastures and bay

meadows, since it has low palatability and negligible forage value. Loosestrife forms such dense stands in waterways that they are often impenetrable to boats, impairing recreational opportunities.

Purple loosestrife has been observed in the North Truckee Drain, which flows into the Truckee River, since the 1970's. It has colonized miles of the Drain, sharing the ditch banks with tall whitetop. Its distribution was largely limited to the Drain and isolated ornamental plantings until the wet winters of 1995, '96 and '97. Following the flood flows of January, 1997, small stands of purple loosestrife have begun to appear in the lower Truckee River, with fears that it has moved throughout the irrigation system to the Carson River and Lahontan Reservoir. The U.S. Fish and Wildlife Service in Reno has allocated post-flood technical assistance funds for the identification and mapping of purple loosestrife in the Truckee River system. The Nevada Division of Agriculture will then take appropriate control measures once the plants have been identified. The invasion is small and new enough that immediate, concerted efforts may allow eradication of the weed from the River. Control in the Sparks Drain will be far more difficult due to the very large number of mature plants present.

Eurasian watermilfoil (*Myriophyllum spicatum*)

Eurasian watermilfoil is a submerged, rooted aquatic plant introduced into the United States from Europe in the 1880's. It slowly spread across the United States primarily by contamination on boats, but also by water birds. Watermilfoil is commonly found in eutrophic, alkaline, hardwater systems where it can form thick underwater stands of tangled stems and vast mats of vegetation at the water's surface. The formation of a plant canopy also limits the light available for existing plants, which favors the expansion of watermilfoil. The overgrowth interferes with water recreation, fowling propellers and clogging air intakes on boats.

Eurasian watermilfoil will grow in water about one to three meters deep, or deeper if light can penetrate. The plant forms long vines which can grow to four times the original size in one year. It reproduces sexually via cross-pollination, and also vegetatively from plant fragments released from stems. These fragments float, develop roots, new stems, and leaves, before sinking and adhering to the bottom substrate.

There is some dispute about the value of this species. When it forms a mat at the water surface, it provides calm water for waterfowl. It may also help improve lake clarity by out-competing undesirable algae for dissolved nutrients. On the other hand, it grows and spreads rapidly, invading and replacing native plant species which may be necessary to support waterfowl. In a study of a newly invading population of Eurasian watermilfoil in Lake George, New York, Madsen et al. (1991), found that over a three-year period, the cover of Eurasian watermilfoil increased from 25% to 97%, and the total number of species dropped from 21 to 9, as shown in Figure 2. Dense canopies result in decreased oxygen exchange (Figure 3), increased nutrient loading, and increased water temperatures (Madsen 1997).

Watermilfoil has been present in Lake Tahoe in the Tahoe Keys area since the 1960's, probably introduced by boats. In the last three years, new pioneer populations were discovered in small marinas outside the Keys. Many fragments of watermilfoil were observed floating at near-shore and off-shore locations, indicating movement by wind, waves, and water currents. Populations in these smaller sites expanded by as much as three-fold in one year, and new sites were discovered in 1996 and 1997, including the Truckee River downstream from Tahoe City Dam.

Since Lake Tahoe is currently phosphorus limited, there is concern that the watermilfoil might mobilize phosphorus from the lake sediment and return the nutrient into the water column, increasing the rate of loss of clarity of the lake. Of equal concern is the appearance of the weed in the Truckee River system. While it has not yet been noted in the Nevada portion of the river, the long duration of high flows which occurred during and after the January 1997 flood suggest that watermilfoil may have been distributed throughout the entire river system. No full-scale monitoring program is currently in place to detect and map new infestations.

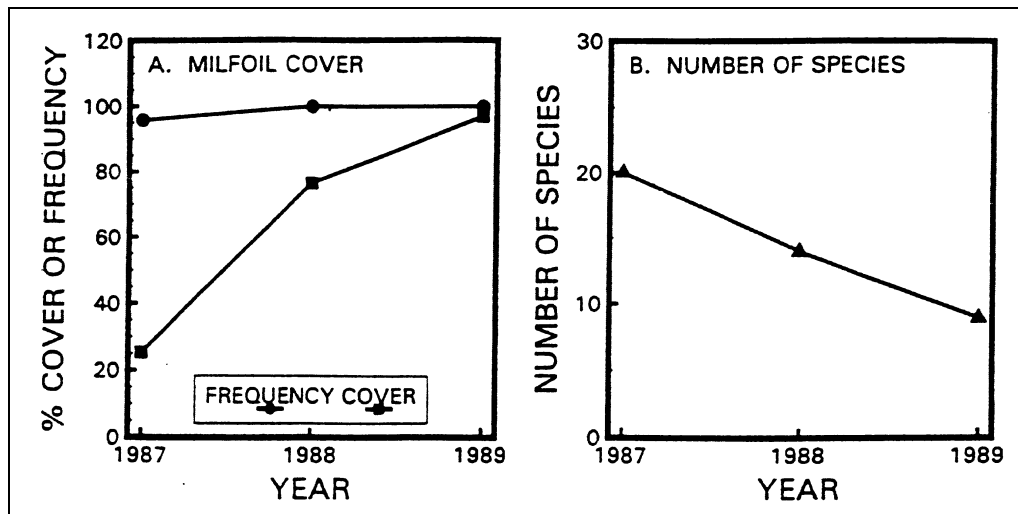


Fig. 2. Change in (A) Eurasian watermilfoil percent frequency and percent cover, and (13) total species richness (from Madsen et al. 1991).

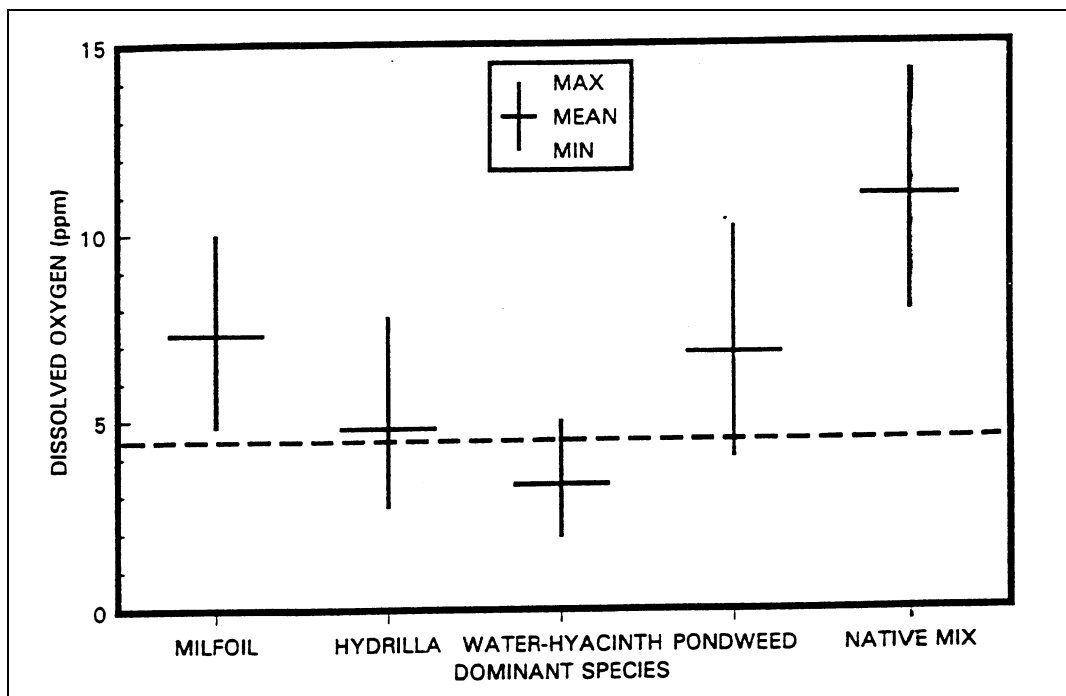


Fig. 3. Changes in dissolved oxygen concentrations in ponds planted with five different vegetative types (from Madsen et al. 1991)

Management of Flood-borne Noxious Weeds

As always, preventing the introduction of weeds into riparian areas is the first line of defense. Prevention is the most cost-effective element of weed management. Once a single plant becomes established, it may produce thousands of seeds, which can float and spread rapidly in river systems. Disturbance from spring flooding and channel readjustment favors invasion by weeds. Methods of prevention include monitoring vehicles and boats

and trailers for seed or rootstock contamination, using weed-free hay or feed, educating hunters, fishers and other sportsmen about the need to monitor for weed contamination, and excluding live stock that have been grazing on weed-infested areas for 7 to 10 days before allowing access to riparian areas (Sheley et al. 1995).

Control of new noxious weed species in the first growing season following flood-borne spread is essential. Whenever possible, weed management efforts should focus not on well established stands, but on mapping the extent of spread of new, small-scale invasions and controlling them prior to reproduction. At this point, eradication of small weed patches can still be achieved. Once the plants have become established through a full growing season, eradication is unlikely. Field personnel should be assigned to document all locations of the weed throughout the entire drainage system (no small feat!). After mapping, the plants should be destroyed by the best control method, and removed from the site if appropriate. Long-term planning should include a revegetation program and follow-up monitoring to make sure initial efforts were successful. This will often require a concerted effort involving many agencies and funding sources, and by volunteer groups like Adopt-a-Stream.

Creative approaches may be needed. Involving local hunters and fishermen, recreationists and other volunteers may make the difference in the success of weed control efforts. A vigorous public education media campaign can be used to alert citizens to the problems posed by noxious weeds in riparian areas. In Nevada, citizen volunteer groups are active in controlling weeds, including "Tamarisk Tamers" in the Humboldt River Basin, and soon-to-be trained Master Gardener "Weed Warriors" in the Truckee River Basin. Labor forces can be augmented by the use of community honor inmate crews who are available through county and state prisons. Efforts are currently underway to map the occurrence of all noxious weeds in Nevada aided by volunteer groups including County Roads crews, Conservation Districts, power companies, endurance riders, hikers, trout fishers and others.

In the aftermath of flood disasters, finding funds for weed control may be difficult. For many years, both the USDA Forest Service and USDI Bureau of Land Management have devoted the majority of their small weed management budgets primarily to control (78 to 82%) vs. detection (11 - 12%) (Dewey et al. 1995). As with wildfires, detection and early reporting will bring far greater returns via rapid response and suppression.

Summary

Riparian areas serve multiple functions in water quality protection, flood control and storm damage prevention, biodiversity, habitat, and recreation. In Nevada, riparian areas represent a tiny fraction of the total land area, but provide more vegetation per acre than any other part of the landscape. During large flood events, as water velocities increase proportionally to flow volumes, the erosive power of the water increases exponentially, increasing sediment transport rates. The result is changes in channel morphology, commonly including scour, widening, deepening, sandbar formation, and avulsion. This disturbance to the channel provides an opportunity for noxious weeds to colonize.

Water has long been recognized as a mechanism for the spread of invasive weeds. Flood flows act to transport seeds and plant parts. As flows recede, the plant matter is deposited on newly formed sandbars and in areas which have been stripped clear of riparian vegetation. Species which are favored by disturbance and by newly mobilized dissolved nutrients will rapidly fill these niches.

Four such species, including tall whitetop (*Lepidium latifolium*), saltcedar (*Tamarix* spp.), purple loosestrife (*Lythrum salicaria*) and Eurasian watermilfoil (*Myriophyllum spicatum*) have been found in previously weed-free reaches of the Truckee River drainage system as a result of flood flows from the January 1997 storm event. These species have in common the ability to reproduce vegetatively, whether by layering (saltcedar), sprouting from roots and crowns (tall whitetop and purple loosestrife) or from floating plant fragments (Eurasian watermilfoil). Their rapid rate of growth allows them to outcompete more desirable riparian vegetation such as cottonwoods, which are normally favored by flood events. Such competitive advantages result in the loss of functional riparian communities, loss of rooting strength and protection against erosion, destruction of habitat for threatened and endangered species, loss of recreation opportunities, and impacts on water quality.

Control of these weed species in the first growing season following flood-borne spread is essential. Management efforts should focus on mapping the extent of spread and control of new invasions prior to maturity.

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Managing Riparian Weeds

Roger L. Sheley, Barbra H. Mullin and Peter K. Fay

Riparian areas are the green zones¹ along the banks of rivers and streams and around springs, bogs, wet meadows, lakes, and ponds. They are some of the most productive ecosystems in the West, displaying a greater diversity of plant and wildlife species than adjoining uplands.

Healthy riparian systems purify water as it moves through the vegetation and soil by removing sediment and some pollutants. Riparian vegetation absorbs and dissipates the energy of flood waters before it can cause serious damage to high value agricultural lands. Healthy vegetation in riparian zones also reduces on-site streambank erosion.

Livestock and numerous wildlife species are dependent upon the diverse habitats found in riparian areas which provide food, water, and cover. Stream-side vegetation also maintains lower summer water temperatures which are favorable for fish.

Riparian areas are extremely valuable in every ecosystem and should be protected from invasion by noxious weeds. Invasive weed species, such as purple loosestrife, can be extremely competitive in a riparian setting, crowding out valuable native species. Studies have shown that weeds often do not stabilize soils as well as native vegetation, which can lead to soil erosion and degradation of the stream channel.

Managing weeds in riparian zones is difficult. It requires an integrated, well-planned, and coordinated strategy based on the way the area is used. Riparian weed management includes the integration of control methods to prevent new weed introductions, detection and eradication of existing infestations, the proper management of livestock and, in some cases, revegetation.

Prevention and Containment

Limiting weed seed dispersal

Preventing the introduction of weeds into riparian areas is critical to their management. Seeds are dispersed to riparian areas by vehicles along highways adjacent to rivers, in hay, on animals, and down stream flow. Once a single plant becomes established, it produces thousands of seeds which are further dispersed into moving water. Nearly all weed seeds float and spread rapidly along waterways. It is natural for weeds to become established along waterways

because there is always disturbance from spring flooding and constant channel movement. Weed seed dispersal can be minimized by:

- 1) refraining from driving vehicles and machinery through weed infestations,
- 2) washing the undercarriage of vehicles and machinery after driving from a weed-infested area to an uninfested area,
- 3) using weed-free hay or feed,
- 4) requesting that campers, hikers, and sportsmen take care in brushing and cleaning themselves, as well as their animals and equipment when recreating in weed infested areas,
- 5) holding livestock that have been grazing weed-infested areas for 7 to 10 days before allowing access to riparian areas. This will allow ample time for seeds to exit their digestive tracks.

Containing neighboring infestations

Containment programs are generally used to restrict the encroachment of large-scale weed infestations into riparian areas. This requires an aggressive control program (often chemical) on the advancing border of the weed infestation, and elimination of pioneer populations that get started in the riparian zone.

Minimize soil disturbance

Many alien weeds have evolved in overgrazed, highly-disturbed conditions. They have developed many characteristics which provide an ecological advantage over native riparian vegetation in disturbed soil. Minimizing soil disturbance by vehicles, machinery, wildlife, streamflow, and livestock is central to preventing weed establishment. One way to reduce extremes in stream flow is to maintain uplands in good ecological condition. This provides safe capture, storage and a slower release of precipitation.

Properly manage desirable vegetation

Proper management of desirable riparian vegetation is essential to prevent weed encroachment. Competitive riparian plants, such as Nebraska sedge, are capable of limiting weed invasion as long as they are managed to maintain

Montana State University Extension Noxious Weed Specialist-Bozeman, Montana Department of Agriculture Weed Specialist-Helena, and Montana State University Professor of Weed Science-Bozeman, respectively. Montana Agric. Exp. Sta. Journal article No. J-3033.

¹The vegetation in "green zones" remain growing and green throughout the season because they have additional access to water.



Hoary cress along canal in western Montana.

their strength and vigor. Besides preventing weed invasion, these species bind soil that would otherwise erode.

Systematic Surveys and Small-Scale Eradication

Early detection of weed introductions in riparian weed management is critical. Eradication of small weed patches is often possible. Once an infestation becomes established, complete eradication is unlikely. Two or 3 careful surveys along waterways and adjacent roadways EACH YEAR by personnel trained to identify weeds will provide adequate early detection.

A small-scale eradication program should be implemented once an invasive weed is detected in a riparian area. The eradication program should include careful delineation of the infested area, the best control methods to use, the approximate number of years that will be needed for control, a revegetation plan (when desirable plant populations do not increase in response to control), and a long-term monitoring program. In many cases, it is useful to estimate the cost of the eradication program for future budgeting.

Grazing Management

Proper livestock grazing is essential to maintain competitive riparian vegetation and streambank stability. Proper livestock class and stocking rates can help prevent weeds from encroaching on riparian areas. Sheep tend to spend less time on riparian areas than cattle, which allows land managers greater control of grazing. Cow-calf pairs tend to concentrate in riparian areas, yearlings generally spend more time on the uplands.

Short duration-high intensity grazing forces livestock to graze weeds as well as desirable riparian vegetation. This helps maintain a balance between plant species within the riparian plant community. Some weeds, such as leafy spurge, can be grazed by sheep or goats in riparian areas. This may shift the competitive balance to desirable species. In southwestern Montana, a rest/rotation grazing system

has been successful for improving riparian vegetation. Under this grazing system, pasture use is rotated so that at least one pasture receives a year-long rest from livestock grazing each year. Try, however, to leave enough streamside stubble to trap sediment in high water events.

Chemical Control

Herbicides must be used with care in riparian areas in order to protect non-target vegetation and prevent water contamination. Use only herbicides that are labelled for riparian areas.

Careful hand applications and spot treatments will help protect non-target vegetation. Time applications when runoff is unlikely, use short-lived or rapidly bound herbicides with low water solubility, and apply above the high water mark to reduce the possibility of water contamination. Prevent herbicide drift by wind onto non-target plants or nearby water by using low pressure systems and coarse-spray nozzles.

Guidelines for selected herbicides for use in riparian areas.

2,4-D

Various labels. Do not apply directly to water except under specific label directions. Some labels allow for overspray on irrigation canal ditchbanks. A Montana Special Local Need Label allows use of PBI/Gordon Amine 400® for use on purple loosestrife around water. Always refer to the labels for specific directions.

fosamine

Krenite®. Noncropland uses. It is permissible to treat ditch banks, seasonally dry flood plains, deltas, marshes, swamps, bogs, and transition areas between upland and lowland sites. Do not apply to open water, fresh water wetlands when water is present, or areas where the herbicide is likely to move into water. Krenite® provides effective control of many woody and brushy species. Use care in riparian areas to protect non-target woody species.

glyphosate

Rodeo® label only. May be applied along ditches, lake and pond banks, streams, and rivers. Do not apply within 1/2 mile of a potable water intake. Non-selective; use care around non-target vegetation.

triclopyr

Garlon®. It is permissible to treat non-irrigation ditchbanks, seasonally dry wetlands, flood plains, deltas, marshes, swamps, bogs, and transitional areas between upland and lowland sites. Do not apply to open water or to water present in fresh water wetlands, reservoirs, rivers, streams, or creeks, below the mean high water mark.



Purple loosestrife in the Snake River-Hells Canyon National Recreation Area.



Spotted knapweed along a river in Montana.

More persistent herbicides, herbicides that readily leach, and herbicides with strict label prohibitions against contamination of water should only be used where one can be assured that they will not drift or each into nearby water of the riparian area. These herbicides include (but are not limited to): clopyralid (Stinger®, Transline®), dicamba (Banvel®), metsulfuron (Ally®, Escort®), and picloram (Tordon®).

Always read and follow label directions and heed their warnings. Discuss your chemical weed control plan with an authority in your state before taking action. Lastly, maintain written records, including the date, location, time, chemical, and rate applied.



Purple loosestrife.

Biological Control

Ideally, natural enemies are well-suited for controlling weeds along riparian areas because they may not impact water quality. Most biological controls, however, only impose stress on weeds. This often results in reduced seed production, but does not KILL the plants. A main objective in riparian weed management is to control weeds IMMEDIATELY to prevent seed production and rapid dispersal by moving water.

Some weeds, such as diffuse and spotted knapweed, have natural enemies which are effective in reducing seed production. For example, seed-gall flies have been reported to reduce knapweed seed production by up to 80%. Establishing seed-feeding biological control agents may limit seed production enough to slow the spread of weeds. Plants should be controlled by other means, however, or the infestation can increase. Biological controls may be somewhat useful on otherwise unmanaged weed infestations. Sole reliance on present biological control agents typically results in little impact on riparian weed infestations.

Mechanical Control

Hand-pulling or grubbing can be an effective method for controlling weeds in riparian areas. This method is especially useful for control of newly established weeds that have not produced seeds or developed an extensive root system. Grubbing each year for 10 to 15 years is required to deplete root and/or seed reserves of well established plants. Perennial plants with extensive root systems, such as leafy spurge and Canada thistle require grubbing once or twice a month for many years to deplete root reserves.

Mowing and cultivation are not recommended in riparian areas. In many cases, mowing does not effect root reserves and may actually increase weed seed production in wet areas by "pruning" the weeds. Cultivation can be an effective weed control method in agricultural lands, but is usually not recommended in riparian areas because of the

risk of erosion. Cultivation is usually required on 3 to 4 week intervals for at least two consecutive years to provide effective control for many perennial weeds.

Revegetation

Riparian vegetation is generally resilient because the habitat is fertile and moisture is abundant. Normally, recovery is rapid after weeds are controlled and proper management is restored. However, residual (suppressed) understory grasses and sedges must be present for recovery. In areas without residual riparian vegetation, revegetation may be necessary to close the plant community and prevent re-invasion by weeds.

Most revegetation programs require spraying glyphosate (Rodeo®) early in the spring, after the majority of the weeds have emerged. Fall herbicide applications increase the risk of erosion because of the loss of stabilizing vegetation during the rainy season. Rodeo® is non-selective and kills most species, therefore spray should be applied

directly to target plants. In areas where a heavy residual weed stand exists, it may be necessary to disk or plow to create a quality seedbed. After the Rodeo® application, the desired seed mixture should be drill seeded. If the site is inaccessible to equipment, broadcast seeding may be used. This method is less effective, and may require repeated attempts. Revegetation programs should be implemented on small units over a series of years to minimize risk of large-scale erosion if seedling establishment is poor.

The seed mixture used depends on the specific site. A local soil or range conservationist can recommend a good seed mixture. In general, reseeding with sedges and grasses is desirable because retreatment with 2,4-D amine, a broadleaf herbicide, may be necessary to control newly emerging weed seedlings. After 3 years, a strong grass or sedge stand should be able to limit invasion by weeds, and re-establishment of broadleaved, and shrubby (willow, cottonwood) riparian species may be possible.

GLYPHOSATE (Accord, Rodeo, Roundup) HERBICIDE – AQUATIC RESOURCE RISKS

ABSTRACT

The three commonly used commercial formulations of isopropylamine salt of glyphosate are Accord, Rodeo, and Roundup. Two of these, Accord and Rodeo are basically isopropylamine salt of glyphosate with no inert ingredients. Roundup includes additionally a polyethoxylated tallow amine surfactant.

Glyphosate is readily soluble in water and strongly sorbed to most soils. The most common methods of application are: backpack (selective) foliar, hack and squirt, and roadside spraying (boom). Toxicity of glyphosate to aquatic species is influenced by water acidity. It is 10 times more toxic in highly acidic water (pH 6 and lower) than in alkaline water (pH 10), thus the LC₅₀ 's are variable (can be as low as 10 mg/l in acid water). The surfactant used in Roundup (POEA) is much more toxic than glyphosate, and toxicity increases in alkaline waters. Glyphosate is not effective as a herbicide on submerged aquatic plants. Most species of algae and macrophytes are less sensitive than fish or aquatic macroinvertebrates.

Glyphosate concentrations in water are reduced rapidly by microbial degradation, dispersion, and binding to particulates. The surfactant POEA acts similarly to glyphosate and has relatively short life in water.

The following summarizes the available risk data for aquatic resources (see appendices 2-3, 2-4, and 2-5):

Compound	Species/Group	Lethal effects	Sublethal effects
Glyphosate only – Rodeo and Accord	Rainbow trout,	LC ₅₀	Behavioral observations – see page A-30
	Chinook salmon	LC ₅₀	None
	Coho salmon	LC ₅₀	Behavioral observations see page A-29
	Sockeye	LC ₅₀	None
	Flathead minnow	LC ₅₀	None
	Channel catfish	LC ₅₀	None
	Bluegill	LC ₅₀	None
	Aquatic invertebrates	LC ₅₀	Biochemical alterations – see page A-35
	Aquatic plants	EC ₅₀	Growth inhibition – see page A-37

Compound	Species/Group	Lethal effects	Sublethal effects
Roundup/POEA	Rainbow trout	LC ₅₀	Behavioral observations – see page A-24
	Sunfish, minnow, catfish, bluegill, bleak	LC ₅₀	None
	Chinook salmon	LC ₅₀	None
	Coho salmon	LC ₅₀	Growth and other sublethal parameters – see page A-25
	Sockeye salmon	LC ₅₀	Some weight averages – See page A-25
	Pink salmon	LC ₅₀	None
	Aquatic Invertebrates	LC ₅₀	None
	Aquatic plants	EC ₅₀	Inhibition of photosynthesis: see page A-37



**SELECTED COMMERCIAL FORMULATIONS OF
GLYPHOSATE -
ACCORD, RODEO, ROUNDUP and ROUNDUP PRO
Risk Assessment
Final Report**

Prepared for:

USDA, Forest Service

Leslie Rubin, COTR

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Biotechnology, Biologics and Environmental Protection
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Task No. 2

USDA Contract No. **53-3187-5-12**
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EXECUTIVE SUMMARY – BACKGROUND

Three commercial formulations of the isopropylamine salt of glyphosate are used by the USDA in vegetation management programs: Accord, Rodeo, and Roundup. This document provides risk assessments for human and health and ecological effects to support the assessment of the environmental consequences of using these products in future Forest Service programs. Glyphosate is a broad-spectrum, non-selective, post-emergence herbicide. The compound is readily soluble in water and strongly sorbed to most types of soils. The three commercial formulations of glyphosate covered by this risk assessment—Accord, Rodeo, and Roundup—all contain the isopropylamine salt of glyphosate. Two of the formulations, Accord and Rodeo, are simply aqueous solutions of the isopropylamine salt of glyphosate and contain no inert ingredients other than water. Roundup is formulated as an aqueous solution of the isopropylamine salt of glyphosate with a polyethoxylated tallow amine surfactant. Technical grade glyphosate also contains an impurity, N-nitrosoglyphosate.

Although aerial applications may be used in some instances, backpack (selective) foliar, hack and squirt, and boom spray or roadside hydraulic spraying are the most common methods for applying glyphosate in Forest Service programs. The typical application rate used by the Forest Service is 1 lb a.i./acre, and few applications will exceed 2.5 lbs a.i./acre. The maximum allowable application rate is 7.5 lbs a.i./acre. In some instances, areas treated with glyphosate may be subject to brown-and-burn operations. In previous Forest Service vegetation management programs, glyphosate has been applied in relatively small amounts, compared with the application of other herbicides.

ECOLOGICAL RISK ASSESSMENT

Standard toxicity bioassays have been conducted on several wildlife species, including mammals, birds, fish, and some terrestrial and aquatic invertebrates, as well as many species of aquatic and terrestrial plants. Furthermore, there are several available field studies that examine the effects of glyphosate applications comparable to those used by the Forest Service. The toxicity studies on terrestrial animals are generally consistent with those on experimental mammals. Although the mechanism of glyphosate toxicity is unclear, glyphosate can cause toxic effects including mortality at sufficiently high dose levels.

suggest that at plausible levels of ambient exposure, direct toxic effects are unlikely. The effects on terrestrial animals appear to be secondary to changes in habitat resulting from toxic effects on vegetation.

The herbicidal activity of glyphosate has been studied extensively. Glyphosate interferes with normal metabolic processes in plants, and, at sufficiently high levels of exposure, may cause cell death, tissue damage, growth inhibition, and death of the plant. The biochemical pathway that is affected is specific to plant species and does not occur in animals.

The toxicity of glyphosate to aquatic species depends on the acidity (pH) of the water. Glyphosate is more toxic in relatively highly acidic water (pH \approx 6) by up to a factor of about 10, compared with alkaline water (pH \approx 10). Generally, the reported LC₅₀ values for aquatic animals range from approximately 10 to 400 mg/L, depending on the species and pH of the water.

A major qualitative difference between the effect of glyphosate and glyphosate formulations on aquatic and terrestrial organisms concerns the surfactant, POEA, used in Roundup. The surfactant is much more toxic than glyphosate to aquatic organisms. Unlike glyphosate, POEA is more toxic in alkaline water than in acidic water. Thus, the relative potency of POEA with respect to glyphosate is pH dependent.

As with the human health risk assessment, there is little indication that glyphosate will cause adverse effects in the environment at anticipated levels of exposure. The small mammal is a conservative target species for characterizing risk because small organisms, in general, will receive higher doses of an agent, compared with larger organisms, at fixed levels of exposure in environmental media (e.g., contaminated food, water, or air). Moreover, the available toxicity data do not suggest any systematic differences in sensitivity to glyphosate among species. The primary route of exposure for terrestrial animals appears to be contaminated vegetation. For this source, levels of contamination remain below those of concern even at the maximum allowable application rate, 7.5 lbs a.i./acre. At application rates anticipated by the Forest Service, levels of exposure are substantially below those of concern. This analysis is consistent with the field studies on glyphosate, which indicate that direct toxic effects are unlikely.

Glyphosate is an effective herbicide, and terrestrial plants will be affected by applications of glyphosate used to control vegetation. Non-target plants could be damaged by unintentional application or drift. The extent of drift will depend on the specific conditions under which the glyphosate is applied. As would be expected, the potential hazards of drift are greater for aerial applications, compared with ground applications. The extent of damage will depend on the plant species and time of application. Field studies involving both ground and aerial applications of glyphosate suggest that the effects of drift are likely to be most evident within 50 m of the application site.

There is not much evidence that aquatic animals or plants will be affected adversely by normal applications of glyphosate. Although glyphosate is registered for use as an aquatic herbicide, it is

only effective on aquatic plants with vegetation growing above the water level. Most species of algae and macrophytes do not appear to be more sensitive than fish or aquatic invertebrates to glyphosate. For most aquatic species, glyphosate levels of 1 mg/L are not likely to cause adverse effects. For aquatic animals, Roundup (glyphosate+POEA) is not likely to cause adverse effects at levels of 0.1 mg/L, measured as glyphosate. Furthermore, there is no evidence that Roundup is more toxic than glyphosate to aquatic plants. Some sensitive species of algae could be affected; however, the effects are likely to be transient, given the rapid dispersion and removal of glyphosate from ambient water.

2. PROGRAM DESCRIPTION

2.1. OVERVIEW

Glyphosate is a broad-spectrum, non-selective, post-emergence systemic herbicide. The compound is readily soluble in water and strongly sorbed to most types of soils. The three commercial formulations of glyphosate covered by this risk assessment—Accord, Rodeo, and Roundup—all contain the isopropylamine salt of glyphosate. Two of the formulations, Accord and Rodeo, are simply aqueous solutions of the isopropylamine salt of glyphosate and contain no inert ingredients other than water. Roundup is formulated as an aqueous solution of the isopropylamine salt of glyphosate with a polyethoxylated tallow amine surfactant. Technical grade glyphosate also contains an impurity, N-nitrosoglyphosate.

Although aerial applications may be used in some instances, backpack (selective) foliar, hack and squirt, and boom spray or roadside hydraulic spraying are the most common methods for applying glyphosate in Forest Service programs. The typical application rate used by the Forest Service is 1 lb a.i./acre and few applications will exceed 2.5 lbs a.i./acre. The maximum allowable application rate is 7.5 lbs a.i./acre. In some instances, areas treated with glyphosate may be subject to brown-and-burn operations. In previous Forest Service vegetation management programs, glyphosate has been applied in relatively small amounts, compared with the application of other herbicides.

2.2. GLYPHOSATE AND COMMERCIAL FORMULATIONS

Glyphosate is a broad-spectrum, non-selective, post-emergence systemic herbicide developed by Monsanto (Franz 1985). The herbicidal properties of glyphosate were first described by Baird et al. (1971). The chemical and toxicological properties of glyphosate are well studied. As of 1985, there were more than 7,000 publications on glyphosate in the literature (Franz 1985). Since 1985, more than 3,000 additional papers on glyphosate have been published.

Glyphosate is the common name for N-(phosphonomethyl)glycine:

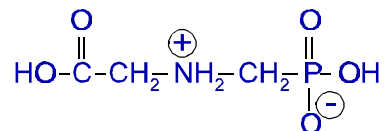


Table 2-1. Physical, chemical, and biochemical properties of glyphosate

CAS Number:	1071-83-6
Molecular weight:	169.07
Melting point (°C):	200 (Tomlin 1994)
Density (g/cm ³):	0.5 (bulk density) (Tomlin 1994)
Density (g/ml):	1.74 (WSSA 1989)
Vapor pressure (mm Hg):	1.94 x 10 ⁻⁷ mm Hg (45° C) (WSSA 1989) < 7 x 10 ⁻⁹ mm Hg (25° C) (Weber 1991) 2.89 x 10 ⁻¹⁰ mm Hg (25° C) (SRC 1995) negligible (Tomlin 1994) practically zero (Hartley and Kidd 1985)
Water solubility:	12 g/L (25°C) (Tomlin 1994) 1.57% (25°C) (WSSA 1989)
Henry's law constant:	insignificant (Reinert and Rodgers 1987) 5.36 x 10 ⁻¹⁵ atm-m ³ /mole (25°C) (calculated from vapor pressure and water solubility)
Log K _{ow} :	-0.70 (pH 1) (Chamberlain et al. 1994) -1.15 (pH 3) (Chamberlain et al. 1994) -1.30 (pH 5) (Chamberlain et al. 1994) -2.90 (pH 7) (Chamberlain et al. 1994) -3.05 (pH 7.5) (Chamberlain et al. 1994) -1.90 (pH 9) (Chamberlain et al. 1994) -0.80 (pH 11) (Chamberlain et al. 1994)
Soil adsorption K _{oc} :	10,000–100,000 (Weber 1991) 554–34,000 (Piccolo et al; 1994) 2,600–4,900 (Glass 1987)
Evaporation rate:	low (Neary et al. 1993)
Foliar half-life (days):	~1.6 (Thompson et al. 1994) 8–10 (Feng and Thompson 1990) 10.6–26.6 (Newton et al. 1984)
Soil half-life (days):	20–40 (Weber 1991) <60 (average) (WSSA 1989) 45–60 (Feng and Thompson 1990) 29–40 (Newton et al. 1984)
Water half-life (days):	50–70 (U.S. EPA 1992a) 14 (minimum rate) (Reinert and Rodgers 1987) 42–70 (Reinert and Rodgers 1987) 3.5–11.2 days [surface water; some glyphosate in the water column was transferred to sediment and not degraded] (Goldsborough and Brown 1993)
Air half-life (days):	5 [estimated; method of Meylan and Howard (1993)]

Some basic chemical and physical properties of glyphosate are summarized in Table 2-1. At ambient temperatures, glyphosate is a white crystal. In the crystalline form, glyphosate has both positive and negative regions of charge, indicated by the circled plus (+) and minus (-) signs in the schematic above. Such dipolar ion species are sometimes referred to as a *zwitterions*. In aqueous solutions, the hydrogen atoms of the carboxylic acid (**COOH**) and phosphate (**PO₂H₂**) groups may be associated (e.g., **-COOH**) or dissociated (e.g., **-COO⁻ + H⁺**) depending on the pH of the solution. The dissociation constants, or pK_a values, for these reactions are illustrated in Figure 2-1. The pH of most biological fluids range from approximately 5 to 9. Thus, within this range of pH, glyphosate has a net negative charge and is predominantly in form of H₂G⁻¹ or HG⁻², as illustrated in Figure 2-1.

Because glyphosate has a relatively low solubility in water, about 12 g/L (see Table 2-1), the compound is usually formulated as a more soluble salt. As summarized in Table 2-2, the three commercial formulations of glyphosate covered by this risk assessment—Accord, Rodeo, and Roundup—all contain the isopropylamine salt of glyphosate. Table 2-2 gives the concentrations both as the isopropylamine salt of glyphosate (a.i.) as well as the acid equivalents of glyphosate (a.e.). Application rates are commonly expressed in units of active ingredient (a.i.), while monitoring studies and some toxicity studies are expressed in units of acid equivalents (a.e.). Unless otherwise specified, units of concentration or application rate are expressed as active ingredient and dose units are expressed as acid equivalents.

Technical grade glyphosate also contains an impurity, N-nitrosoglyphosate, which is sometimes abbreviated as NNG. The U.S. EPA has determined that 92% of technical grade glyphosate contains NNG at less than one part per million (<1 mg/L) and that this amount is toxicologically insignificant. Similarly, the surfactant used in Roundup contains 1,4-dioxane as an impurity. The upper limit of this compound in Roundup is about 0.03% (Monsanto 1990). In a previous review, the U.S. Forest Service determined that the amount of exposure to 1,4-dioxane is toxicologically insignificant (Borrecco and Neisess 1991). Both of these assessments are discussed further in the hazard identification (section 3.1).

Two of the formulations, Accord and Rodeo, are simply aqueous solutions of the isopropylamine salt of glyphosate and contain no inert ingredients other than water. Roundup is an aqueous solution of the isopropylamine salt of glyphosate with a polyethoxylated tallow amine surfactant. This material is referred to in the literature as MON 0139, with the MON presumably referring to Monsanto, or polyoxyethyleneamine (POEA) (Smith and Oehme 1992). The surfactant in Roundup is present at 15% (Hoogheem 1987; Sawada et al. 1988) or 150 g/L assuming that the 15% value refers to the level in terms of weight per unit volume. Presumably, the Roundup surfactant is a derivative of tallow, a complex mixture of fat from the fatty tissue of cattle or sheep. Tallow contains a variety of fatty acids including oleic (37–43%), palmitic (24–32%), stearic (20–25%), myristic (3–6%), and linoleic (2–3%) acids as well as small amounts of cholesterol, arachidonic, elaidic, and vaccenic acids (Budavari 1989). As discussed in the hazard identification for human health (section 3.1) and ecological effects (section 4.1), the presence of the surfactant must be considered in the risk assessments of Roundup. Roundup Pro is a recently

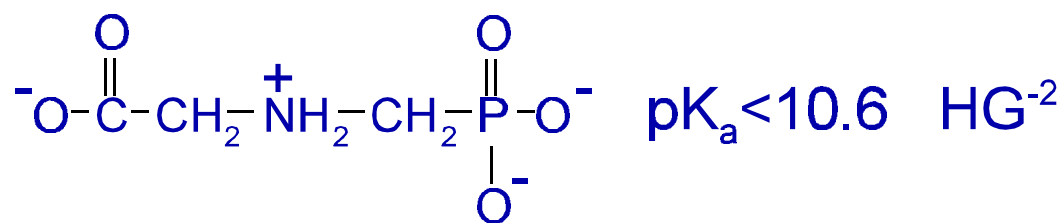
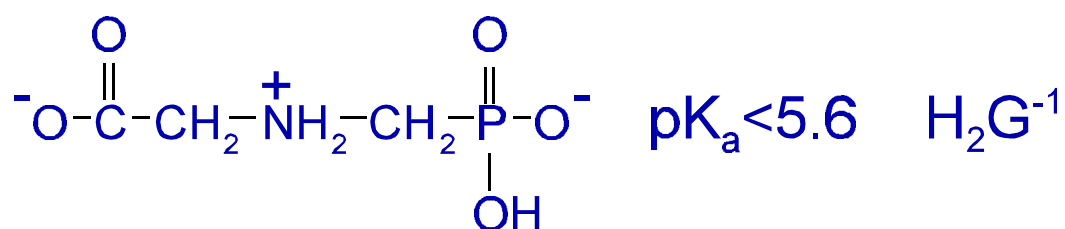
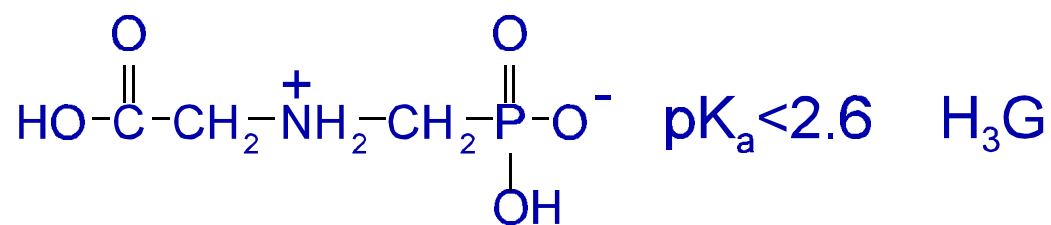
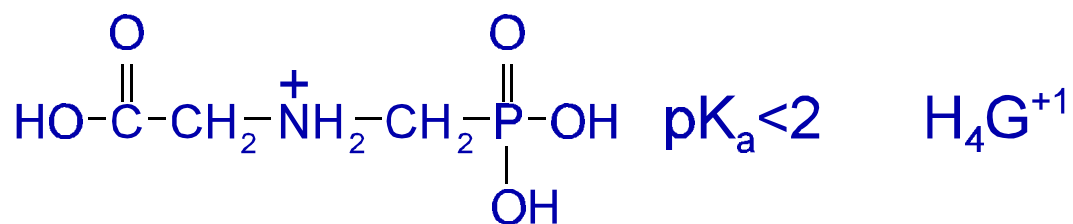


Figure 2-1. Structure and dissociation constants (pK_a) for the various forms of glyphosate.

introduced formulation of glyphosate that contains a phosphate ester neutralized polyethoxylated tallowamine surfactant at a level of 14.5% (Monsanto 1995 a,b; Monsanto 1996) or 145 g/L. Other than the specification that the tallow amine surfactant in Roundup Pro is a phosphate ester of POEA, no published information is available on the chemical differences between the surfactant in Roundup and Roundup Pro. As detailed in Sections 3 and 4, there is relatively little information available on the toxicity of Roundup Pro.

Table 2-2. Summary of commercial formulations containing glyphosate covered by this risk assessment^a

Formulation	Ingredient	Pounds (a.i.)/gallon	Pounds (a.e.)/gallon	Grams (a.e.)/L
Accord (Monsanto)	glyphosate, isopropylamine salt (41.5%) inerts (58.5%) water	4	3	356
Rodeo (Monsanto)	glyphosate, isopropylamine salt (53.8%) inerts (46.2%) water	5.4	4	480
Roundup (Monsanto)	glyphosate, isopropylamine salt (41%) inerts (59%) ethoxylated tallow amines (CAS No. 61791-26-2), 15% ^b , and water	4	3	356
Roundup Pro (Monsanto)	glyphosate, isopropylamine salt (41%) inerts (59%) phosphate ester neutralized ethoxylated tallow amines, 14.5% ^c , and water	4	3	356

^aTaken from Monsanto (1993, 1994a,b, 1995a) (unless otherwise specified).

^bHoogheem (1987) (Letter Feb 27 to Larry Gross).

^cMonsanto 1995b.

a.e. = acid equivalents; a.i. = active ingredient

2.3. APPLICATION METHODS

Proposed application methods and vegetation management uses for glyphosate are summarized in Table 2-3. Detailed descriptions of the silvicultural uses of herbicides and the various methods of herbicide applications are available in the general literature (e.g., Cantrell and Hyland 1985) and earlier environmental impact statements conducted by the Forest Service (USDA 1989a,b,c). The following summary focuses on those aspects of application that are most germane to the exposure assessments (sections 3.2 and 4.2).

Table 2-3. Proposed uses and application methods for glyphosate

Use	Application Method			
	Broadcast		Selective	
	Aerial	Boom Spray	Backpack (Selective Foliar)	Cut Surface (Hack and Squirt)
Conifer release	O		M	F
General weeds			M	
Noxious weeds			M	
Rights-of-way	F	F	M	F
Site preparation	F		M	F
Vegetation			M	F
Wildlife habitat improvement		M	M	

M = Planned Use **F** = Potential use

O = Done commercially but not used by the Forest Service

The most commonly used application method is the backpack (selective) foliar application. In selective foliar applications, the herbicide sprayer or container is carried by backpack and the herbicide is applied to selected target vegetation. Application crews may treat up to shoulder high brush, and chemical contact with the arms, hands, or face is plausible. To reduce the likelihood of

significant exposure, application crews are directed not to walk through treated vegetation. Typically, a worker will treat approximately 0.5 acres/hour with a plausible range of 0.2–51.0 acres/hour.

Hack and squirt applications are a form of cut surface treatment in which the bark and cambium of a standing tree is cut with a hatchet and the herbicide is then applied to the cut using a squirt bottle. This treatment is used to eliminate large trees during site preparation, conifer release operations, or rights-of-way maintenance. As with selective foliar applications, a worker usually will treat approximately 0.5 acres/hour with a plausible range of 0.25–1.0 acres/hour.

Boom spray or roadside hydraulic broadcast spraying is used primarily in rights-of-way management. Spray equipment mounted on tractors or trucks is used to apply the herbicide on either side of the roadway. Boom spray may also be used for maintenance or rehabilitation of wildlife openings, with spray equipment mounted on or towed behind tractors. Usually, about 8 acres will be treated in a 45-minute period [approximately 11 acres/hour] with approximately 200 gallons of the herbicide mixture [270 gallons/hour]. Some special truck mounted spray systems may be used to treat up to 12 acres in a 35-minute period with approximately 300 gallons of herbicide mixture [about 21 acres/hour and 510 gallons/hour] (USDA 1989b, p 2-9 to 2-10).

Aerial applications may involve the use of fixed wing aircraft (Roundup and Rodeo) or helicopters (Accord, Rodeo, and Roundup). Liquid formulations of glyphosate are applied through specially designed spray nozzles and booms. The nozzles are designed to minimize turbulence and maintain a large droplet size, both of which contribute to a reduction in spray drift. Aerial applications may only be made under meteorological conditions that minimize the potential for spray drift. In aerial applications, approximately 40–100 acres may be treated per hour.

In some instances, areas treated with glyphosate may be subject to brown-and-burn operations. As indicated in USDA (1989b), these operations involve burning a treated area 45–180 days after treatment with the herbicide.

2.4. MIXING AND APPLICATION RATES

Accord is labeled for use in forestry site preparation, utility rights-of-way maintenance, as well as conifer and hardwood release for application as a foliar spray to control or destroy most herbaceous and woody plants. For both ground and aerial applications for site preparation and rights-of-way management, the maximum labeled rate is 10 quarts/acre, which is equivalent to 7.5 lbs a.e./acre [2.5 gallons/acre · 3 lbs a.e./gallons]. The maximum amount that may be applied in a single season is 10.6 quarts/acre or approximately 8 lbs a.e./acre [10.6 quarts/acre · 0.25 gallons/quart · 3 lbs a.e./gallons]. For conifer or hardwood release, much lower application rates are used, generally 1–2 quarts/acre [0.75–1.5 lbs a.e./acre], although as many as 3 quarts/acre [2.25 lbs a.e./acre] may be used in Maine for difficult to control species. To be effective in any of these applications, Accord must be mixed with a nonionic surfactant with greater than 50% active

ingredient. The product label for Accord (Monsanto 1994a) indicates that a surfactant is required for some applications:

In forestry site preparation and utility rights-of-way management, this product requires use with a nonionic surfactant. Use a nonionic surfactant with greater than 50 percent active ingredient and labeled for use with herbicides. The use of this product without surfactant will result in reduced performance.

As indicated in Table 2-2, Roundup and Roundup Pro contain the same amount of glyphosate as Accord, 3 lbs a.e./gallon. In addition, both Roundup and Roundup Pro contain a surfactant, ethoxylated tallow amine at a concentration of 15% (Roundup) or a phosphate ester neutralized polyethoxylated tallow amine (Roundup Pro). Also as with Accord, these products are applied to terrestrial vegetation for the control of undesirable plant species. Roundup, however, is registered for both crop and non-crop applications. Roundup Pro is labeled only for non-crop uses. Another Monsanto product, Roundup Ultra, appears to be identical to Roundup Pro but is labeled for agricultural uses (Matura 1996a,b). For both Roundup and Roundup Pro, the maximum labeled application rate is 5 quarts/acre or 3.75 lbs a.e./acre [1.25 gallons/acre · 3 lbs a.e./gallons]. Many weeds, however, are controlled at application rates of 1 quart/acre. As with Accord, the maximum amount of both Roundup formulations that may be applied in a single season is 10.6 quarts/acre or approximately 8 lbs a.e./acre [10.6 quarts/acre · 0.25 gallons/quart · 3 lbs a.e./gallons] (Monsanto 1994b, 1995a).

As also indicated in Table 2-2, Rodeo is essentially the same product as Accord except that glyphosate is present at a higher concentration, 4 lbs a.e./gallon in Rodeo and 3 lbs a.e./gallon in Accord. Rodeo is registered for the control of both terrestrial and aquatic plants. As with Accord, the label for Rodeo recommends the use of a nonionic surfactant. For both terrestrial and aquatic vegetation, the highest recommended application rate is 7.5 pints/acre or 3.75 lbs a.e./acre [3.75 quarts/acre · 0.25 gallons/quart · 4 lbs a.e./gallon] (Monsanto 1993). In terms of acid equivalents of glyphosate, this is the same as the maximum application rate of Roundup and 50% of the maximum application rate of Accord.

The Forest Service does not plan to use glyphosate at the highest labelled application rates. In 1995, the typical rate for glyphosate was about 1 lb a.i./acre. All but one application (2.8 lb a.i./acre) was less than 2.5 lb a.i./acre (USDA/FS 1995).

In previously conducted Forest Service vegetation management programs (USDA 1989a,b,c), glyphosate was applied in relatively small amounts, compared with the application of other herbicides. For example, in Forest Service Region 8 (comprised of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North California, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and part of West Virginia), there are approximately 12,000,000 acres

of National Forests and Grassland, of which up to 600,000 acres are treated with various herbicides each year. In the late 1980s, glyphosate was applied to 9,700 acres/year, 0.081% of the total area and 1.6% of the treated area (USDA 1989b, p.2-4). In recent years, Forest Service use of herbicides in Region 8 has been reduced to treatment of fewer than 100,000 acres/year. In 1995, only 3,704.2 acres were treated with glyphosate (USDA/FS 1995).

4. ECOLOGICAL RISK ASSESSMENT

4.1. HAZARD IDENTIFICATION

4.1.1. Overview. Standard toxicity bioassays have been conducted on several wildlife species, including mammals, birds, fish, and some terrestrial and aquatic invertebrates, as well as many species of aquatic and terrestrial plants. In addition, a number of field studies have been conducted on effects of glyphosate applications that are comparable or almost the same as those used by the Forest Service.

The toxicity studies on terrestrial animals are generally consistent with those on experimental mammals. Although the mechanism of glyphosate toxicity is unclear, glyphosate can cause toxic effects including mortality at sufficiently high dose levels. The available field studies, however, clearly suggest that at plausible levels of ambient exposure, direct toxic effects are unlikely. The effects on terrestrial organisms appear to be secondary to changes in habitat resulting from toxic effects on vegetation.

The herbicidal activity of glyphosate has been studied extensively. Glyphosate interferes with normal metabolic processes in plants, which in sufficiently high exposures, may result in cell death, tissue damage, growth inhibition, and death of the plant. The biochemical pathway that is affected is specific to the plant species and does not occur in animals.

The toxicity of glyphosate to aquatic species depends on the acidity (pH) of the water. Glyphosate is more toxic in relatively acidic waters (pH \approx 6) by as much as a factor of 10, compared with alkaline waters (pH \approx 10). In general, the reported LC₅₀ values for aquatic animals range from approximately 10 to 400 mg/L, depending on the species and pH of the water.

A major qualitative difference between the effect of glyphosate and glyphosate formulations on aquatic and terrestrial organisms concerns a polyethoxylated tallow amine surfactant (POEA) used in Roundup. For aquatic organisms, the surfactant is much more toxic than glyphosate. Unlike glyphosate, POEA is more toxic in alkaline water than in acid water. Thus, the relative potency of POEA with respect to glyphosate is pH dependent.

Table 4-1. Estimates of relative potency and toxicological interaction of glyphosate and POEA^a

Species/Assay/Study	Observed LC ₅₀ values				Predicted LC ₅₀	Pred.÷ Obs.
	Glyphosate	POEA	Roundup _b	ρ		
	pH 6.5					
Rainbow trout	140	7.4	10.8	19	22	2.0
Bluegills	140	1.3	6.0	108	3.1	0.5
	pH 7.2, 96 hr unless specified					
Midge larvae, 48 hr.	55	13	25	4.2	28	1.1
Rainbow trout	140	2	11.8	70	6.5	0.6
Fathead minnow	97	1.0	3.2	97	3.2	1.0
Channel catfish	130	13	18	10	35	1.9
Bluegills	140	3.0	7.1	47	9.5	1.3
	pH 9.5					
Rainbow trout	240	0.65	2.0	369	2.1	1.1
Bluegills	220	1.0	2.6	220	3.3	1.3

^aData from Folmar et al. (1979).

^bValue reported by Folmar as mg a.i multiplied 1.42 to account for added mass of surfactant.

$\rho = \text{LC}_{50} \text{ of glyphosate} \div \text{LC}_{50} \text{ of POEA.}$

The magnitude of the difference can be expressed in various ways, the simplest of which is the ratio of the concentrations or equivalently the ratios of the proportions adjusted for the difference in potency:

$$\frac{D \cdot B_2}{B_1} \quad (4-1)$$

For example, if the relative potency is 70, as it is in Table 4-1 for rainbow trout at pH 7.2, POEA may be said to contribute 30 [$70 \cdot 0.3 \div 0.7$] times more than glyphosate to the toxicity of the mixture.

This method of describing relative toxic contribution is based on the assumption that the components in the mixture do not affect one another (i.e., there are no toxicological interactions). For terrestrial plants, such interactions have been clearly documented. One method for assessing whether or not similar interactions are plausible in aquatic species is to compare the observed LC₅₀ values for Roundup to the LC₅₀ values that would be predicted by one model of non-

interactive joint action, simple similar action (Finney 1971, Durkin 1981). Using this assumption, the expected LC_{50} can be calculated as:

$$LC_{50_{Roundup}} = \frac{LC_{50_{Glyphosate}}}{(\mathbf{B}_G + \mathbf{DB}_S)} \quad (4-2)$$

where π and ρ are as defined above.

The predicted LC_{50} values for Roundup based on this assumption are presented in the second to the last column of Table 4-1, and the ratio of the predicted to observed LC_{50} values are given in the last column. Ratios >1 suggest some form of greater than additive toxicity, and, conversely, ratios <1 indicate less than additive toxicity. Note also that the observed LC_{50} values for Roundup are presented as the total concentration of glyphosate and POEA. In other words, the LC_{50} values for Roundup reported in Folmar et al. (1979) are multiplied by 1.42 $((352+150)\div352)$ and give the LC_{50} values in units of weight of both glyphosate and POEA. These units are required for the above equation 4-2.

As indicated in Table 4-1, there is a tendency for the toxicity of glyphosate to decrease (i.e., the LC_{50} values increase—as the pH increases), although the changes are not substantial. The effect of pH on POEA is also not substantial but the effect seems to be the opposite of the effect that pH has on glyphosate. In all of the bioassays, the surfactant is more toxic than glyphosate. Because of the effect of pH on toxicity, the relative potency of POEA increases as pH increases. At all pH levels, the ratio of predicted to observed LC_{50} values for Roundup does not deviate remarkably or systematically from unity, suggesting that no substantial interactions take place between these two compounds.

A similar analysis of the results presented by Wan et al. (1989) are summarized in Table 4-2. In general, this study agrees well with the earlier study by Folmar et al. (1979). In all cases, the surfactant is substantially more toxic than glyphosate. The effect of pH is more consistent and more substantial: the toxicity of glyphosate decreases and the toxicity of the surfactant increases with increasing pH. Consequently, the relative potency of the surfactant to glyphosate also increases with increasing pH. The LC_{50} values reported in Wan et al. (1989) for Roundup are expressed as "*mg product/L.*" In calculating the expected LC_{50} values for Roundup in Table 4-2, it is assumed that these LC_{50} values include the concentrations of both glyphosate and the surfactant. As indicated in the last column of this table, the ratio of the predicted to observed LC_{50} values for Roundup are consistently <1 , indicating a less than additive interaction.

The significance of this information to the current risk assessment is that much of the toxicity and all of the available monitoring data used in the risk assessment for aquatic species is on glyphosate rather than the surfactant. Because POEA is the toxic agent of primary concern in Roundup, the monitoring data used in the exposure assessment and toxicity data used in the dose response assessment must be adjusted, as discussed below, to consider the differences in potency between these two agents.

Table 4-2. Estimates of relative potency and toxicological interaction of glyphosate and POEA in five species of salmonids^a

Species/Assay/Study	Observed 96-hour LC ₅₀ Values					
	Glyphosate	POEA	Roundup ^a	ρ	Predicted LC ₅₀	Pred.÷ Obs.
Soft Water pH 6.3						
Coho	27	4.6	32	5.9	10.9	0.34
Chum	10	2.7	20	3.7	5.5	0.28
Chinook	19	2.8	33	6.8	6.9	0.21
Pink	14	4.5	33	3.1	8.5	0.26
Rainbow	10	2	33	5	4.5	0.13
Soft Water pH 7.2						
Coho	36	3.2	27	11.3	8.8	0.33
Chum	22	4.2	19	5.2	9.7	0.51
Chinook	30	2.8	27	10.7	7.5	0.28
Pink	23	2.8	31	8.2	7.2	0.23
Rainbow	22	2.5	15	8.8	6.6	0.44
Hard Water pH 8.2						
Coho	210	1.8	13	117	5.9	0.45
Chum	202	1.4	11	144	4.6	0.41
Chinook	220	1.7	17	129	5.6	0.32
Pink	380	1.4	14	261	4.6	0.33
Rainbow	220	1.7	14	129	5.6	0.40

^aData from Wan et al. (1989)

^bAs reported by Wan et al. (1989) in units of mg product/L.

4.2.3. Aquatic Organisms. As discussed in section 3.2.3.4, fields studies indicate that maximum initial concentrations of glyphosate in water after aerial or ground applications can be estimated, based on application rates, at 0.088–0.093 mg/L·lb applied. Glyphosate concentrations in natural water will diminish rapidly due to microbial degradation, binding to suspended particulate, or dispersion.

While these estimates can be used directly to estimate the effects of glyphosate alone, the Roundup formulation of glyphosate contains a surfactant, and, as discussed in section 4.1.3, the surfactant is the primary toxicant of concern for the toxic effects of Roundup on fish. Unpublished studies conducted by Monsanto (Hoogheem 1987, Letter Feb 27 to Larry Gross with attachments) indicate that the surfactant, like glyphosate, will have a relatively short

residency time in ambient water. Nonetheless, because of the acute toxic effects of the surfactant, the added toxic burden of the surfactant must be considered in the risk assessment. As discussed in the following section, however, there are adequate data regarding the toxicity of Roundup to aquatic species to support separate dose-response relationships. Consequently, the exposure rates given above will be applied to all glyphosate formulations, and the fact that Roundup has a relatively greater degree of toxicity will be considered in the dose-response assessment.

4.3.3. Aquatic Organisms.

4.3.3.1. Fish -- As summarized in Appendix 2-3 and reviewed by U.S. EPA (1993b, RED) as well as Smith and Oehme (1992), glyphosate is relatively non-toxic to fish, with 24- to 96-hour LC₅₀ values ranging from approximately 10 mg/L at a relatively acidic pH (≈6) to >200 mg/L at alkaline pH (≈10). As noted in Appendix 2-3, much higher LC₅₀ values have been reported for glyphosate in some species. Specific reasons for these discrepancies have not been identified. The results of acute aquatic bioassays can be highly variable depending on experimental conditions and the initial state of the organisms assayed.

As discussed in section 4.1.3, Roundup and the surfactant used in Roundup are substantially more toxic and relationship of pH to toxicity is the opposite of that for glyphosate. At a relatively

acidic pH, LC₅₀ values for Roundup range from about 6 mg/L to about 30 mg/L for various species. At an alkaline pH, LC₅₀ values approach 1 mg/L.

There is a very weak duration-response relationship for glyphosate, like the pattern seen for the effect of time on the response of experimental mammals (see section 3.3.3). This has been demonstrated clearly in the bioassays conducted by both Folmar et al. (1979) and Wan et al. (1989), each of which presents 24-, 48-, and 96-hour LC₅₀ values for several species of fish. A comparison of the 24- and 48-hour LC₅₀ values from these studies is given in Appendix 2-3. In no case does the difference vary by more than a factor of 2.

In addition to a weak time-response relationship, glyphosate appears to exhibit a relatively steep dose-severity relationship. In other words, the threshold for toxicity seems to be relatively close to levels that cause substantial lethality. This has been demonstrated both by Anton et al. (1994) for three formulations of glyphosate. In this study, the ratio of 96-hour LC₅₀ values to 96-hour NOECs (no observed effect concentrations) ranged from about 6 to 3. In other words, a decrease in concentration by only a factor of 3–6 reduced the toxic response from substantial lethality to no apparent effect.

Both the weak dose-response relationship and strong dose-severity relationship are consistent with the available long-term studies in fish. As summarized by U.S. EPA (1993b, p. 40-41), the 96-hour LC₅₀ for glyphosate in the fathead minnow is 97 mg/L, and the chronic NOEC from a full life cycle study in this species was only about 4 times less, 25.7 mg/L. For Roundup, a 10-day NOEC of 2.78 mg/L at pH 5.7 has been reported for Coho salmon (Mitchell et al. 1987a). Higher concentrations were not tested. The NOEC, however, is only a factor of about 10 less than the LC₅₀ reported by Wan et al. (1989) for this species at a pH of 6.3.

For assessing the potential for toxic effects in fish, a reference concentration of 1 mg/L will be used for glyphosate. This is about a factor of 10 less than the lowest reported LC₅₀. For Roundup, a 10-fold lower value will be used, 0.1 mg/L. Again, this is about a factor of 10 less than the lowest reported LC₅₀. At these levels, there is no reason to anticipate acute or long-term effects in fish. As these levels are exceeded, effects might be seen in some organisms depending on the pH of the water.

4.3.3.2. Aquatic Invertebrates -- The toxicity of glyphosate and Roundup to aquatic invertebrates is summarized in Appendix 2-4. As with fish, highly variable results have been reported. Where comparable data are available, however, the patterns appear to be similar to those observed in fish. For example, LC₅₀ values using daphnia are comparable for glyphosate (780 mg/L) and Rodeo (930 mg/L) but much lower for Roundup (5.3 mg/L) (Monsanto Co. 1982a, Appendix 3-3).

Table 4-4. Acute toxicity of glyphosate (Rodeo) and adjuvants*

Organism	Duration (hours)	LC ₅₀ Values (mg/L)	
		Glyphosate	X-77 Spreader
<i>Daphnia magna</i> , water flea	48	218	2.0
<i>Hyalella azteca</i> , amphipod	96	720	5.3
<i>Chironomus riparius</i> , midge	48	1,216	10
<i>Nephelopsis obscura</i> , bait leech	96	1,177	14

*Source: Henry et al. (1994)

The toxicity of glyphosate and a surfactant, X-77 Spreader, used with Rodeo has been examined by Henry et al. (1994), using several species of aquatic invertebrates (Table 4-4). This study also provides data regarding the toxicity of Chem-Trol, another adjuvant that was used with Rodeo. Chem-Trol was virtually non-toxic (LC₅₀ >28,000 mg/L) and information about this agent is not reviewed further in this risk assessment. All bioassays were conducted at a pH of 8.1–8.2. Like the results reported by Folmar et al. (1979) and Wan et al. (1989) for fish, the surfactant was much more toxic than glyphosate, with the relative potencies of the surfactant ranging from about 83 to 135. These relative potencies are only somewhat less than those reported by Folmar et al. (1979) for bioassays conducted at pH 9.5 (see Table 4-1) and overlap with those reported by Wan et al. (1989) for bioassays conducted at pH 8.2 (see Table 4-2). *Daphnia* were significantly more sensitive than the other invertebrates to glyphosate. The LC₅₀ for *daphnia*, 218 mg/L, is about the same as that reported for fish at a comparable pH. Henry et al. (1994) also conducted a series of experiments on mixtures of glyphosate, the surfactant, and Chem-Trol. Like the results of the earlier studies on fish, no remarkable deviations from additivity were noted.

In a study of avoidance behavior, Folmar (1978) noted that mayflies avoided Roundup at concentrations of 10 mg/L; however, no effect was noted at concentrations of 1 mg/L.

Because the available data on aquatic invertebrates are similar to those with fish, reference concentrations for fish will be used also for invertebrates.

4.3.3.3. Aquatic Plants -- The toxicity of glyphosate and Roundup to aquatic plants is summarized in Appendix 2-5. As indicated in this appendix, the available data suggests that glyphosate is not preferentially toxic to aquatic plants when exposures occur via contaminated water. Although glyphosate is registered for use in the control of aquatic vegetation, it is not effective if all or most of the foliage is under water (Monsanto Co. 1993, Rodeo product). As with the effect on terrestrial plants, direct foliar absorption is the primary route of absorption.

The only substantial inconsistency in the available literature concerns the inhibition of *Anabaena flosaquae*. U.S. EPA (1993b) reports an LC_{50} of 11.7 mg/L, and an LC_{50} of 304 mg/L is reported by Maule and Wright (1984). As noted above, the results of bioassays on the same species can differ remarkably with differences in experimental conditions. The reasons for the differences in the results reported by Maule and Wright (1984) and U.S. EPA (1993b) are not apparent. The U.S. EPA summary does not provide detailed information about experimental conditions.

The study by Peterson et al. (1994) is specifically designed to assess the impact of glyphosate at ambient levels. As summarized in Appendix 2-5, these investigators assessed the inhibition of carbon fixation in various species of green algae and cyanobacter as well as one macrophyte, *Lemna minor*, from exposure to glyphosate in water at a concentration of 2.8 mg a.i./L. This concentration was selected because, following the exposure assumptions used by these investigators [application on to a 15 cm deep body of water], a concentration of 2.8 mg a.i./L could be associated with an application rate of 4.272 kg/ha (\approx 3.8 lbs a.i./acre). As discussed in section 4.2.2.3, this risk assessment assumes an exposure factor of 0.093 mg/L · lb applied. At an application rate of 3.8 lb/acre, this would be associated with an exposure level of 0.35 mg/L. The nearly 10-fold difference is due to the fact that the exposure assumptions used by Peterson et al. (1994) do not consider dispersion, particulate binding, or other removal processes. At a concentration of 2.8 mg/L, substantial (>20%) inhibition was observed in only two species of green algae. No effect was seen on *Lemna minor*.

The only information regarding the effect of Roundup on aquatic vegetation comes from the study by Goldsborough and Brown (1989) in which the EC_{50} values for the inhibition of photosynthesis in a mixed population of algae from several different ponds ranged from 35.4 to 44.4 mg/L. The NOEC for this effect was 0.89 mg/L. These values seem to be consistent with those for glyphosate.

A concentration of 1 mg/L would not be sufficiently protective for most algal species. The lowest EC_{50} is 0.85 mg/L or about 1 mg/L. The relationship between EC_{50} values and NOECs has not been studied extensively for glyphosate. The study by Goldsborough and Brown (1989) indicates that the values differ by a factor of about 40. Thus, the reference concentration for sensitive algal species would be about 0.02 mg/L [$0.85 \text{ mg/L} \div 40$]. Based on the study by Peterson et al. (1994), it is apparent that some species of algae would be unaffected by concentrations more than 100 times greater than this level.

4.4. RISK CHARACTERIZATION

4.4.1. Overview. As with the human health risk assessment, there is very little indication that glyphosate will cause adverse effects in the environment at anticipated levels of exposure. The small mammal is used as a conservative target species for characterizing risk because small organisms, compared with large organisms, generally receive higher doses of an agent at fixed levels of exposure in environmental media (e.g., contaminated food, water, or air). In addition, the available toxicity data do not suggest the existence of systematic differences in sensitivity to glyphosate among species. As in the human health risk assessment, the primary route of exposure for terrestrial animals appears to be contaminated vegetation. For this source, levels of contamination remain below those of concern even at the highest allowable application rate, 7.5 lbs a.i./acre. At application rates anticipated by the Forest Service, levels of exposure are substantially below those of concern. This analysis is consistent with the field studies on glyphosate that indicate the unlikelihood of direct toxic effects.

Glyphosate is an effective herbicide, and terrestrial plants will be affected by applications of glyphosate used to control vegetation. Non-target plants could be damaged by unintentional application or drift. The extent of drift will depend on the specific conditions under which the application occurs. As would be expected, the potential hazards of drift are greater for aerial than ground applications. The extent of damage will depend on the species of plant and the time of application. Field studies involving both ground and aerial applications of glyphosate suggest that the effects of drift are likely to be most evident within 50 m of the application site.

There is little evidence to suggest that aquatic animals or plants will be adversely affected by normal applications of glyphosate. Although glyphosate is registered for use as an aquatic herbicide, it is only effective on aquatic plants whose vegetation is above the water level. Most species of algae and macrophytes do not appear to be more sensitive than fish or aquatic invertebrates are to glyphosate. For most aquatic species, glyphosate levels of 1 mg/L are not likely to cause detectable adverse effects. For aquatic animals, Roundup (glyphosate+POEA) is not likely to cause adverse effects at levels of 0.1 mg/L, measured as glyphosate. There is no reason to suggest that Roundup is more toxic than glyphosate to aquatic plants. Some sensitive species of algae, however, could be affected. Given the rapid dispersion or removal of glyphosate from ambient waters, these effects would most likely be transient.

4.4.3. Aquatic Organisms. As discussed in section 4.3., the reference concentration for fish and aquatic invertebrates based on the results of laboratory bioassays is 1 mg glyphosate/L. Roundup is much more toxic because of the presence of the surfactant. When expressed as concentrations of glyphosate, the reference concentration is 0.1 mg/L. At these reference levels, no adverse effects would be anticipated in the most sensitive species. As concentrations increase above these levels, adverse effects would be anticipated. Most algal species are no more sensitive than fish or invertebrates are to glyphosate. Some species, however, might show evidence of marked growth inhibition at glyphosate concentrations of about 1–3 mg/L. The reference concentration for sensitive algal species is 0.02 mg/L.

As discussed in section 4.2, an exposure rate of 0.088–0.093 mg glyphosate/L·lb a.i. applied can be derived primarily from monitoring studies. For the risk characterization, this value will be rounded to 0.1 mg/L·lb a.i. applied per acre.

At the typical application rate of 1 lb a.i./acre, the anticipated levels in water initially after exposure would be about 0.1 mg/L. At this level, no adverse effects on fish, aquatic invertebrates, macrophytes, or most species of algae would be anticipated from the application of Accord, Rodeo, or Roundup.

At the maximum labelled application rate, 7.5 lbs a.i./acre, concentrations of glyphosate would be expected to reach about 0.75 mg/L. At this level, no effects on fish, aquatic invertebrates, macrophytes, or most species of algae would be expected from the application of Accord or Rodeo. This concentration of glyphosate after the application of Roundup, however, would be close to the LC_{50} for some species of fish and aquatic invertebrates at a pH ranges of about 7–9. At the highest anticipated application rate, the reference level for glyphosate from applications of Roundup would be exceeded by a factor of 2.5. It is not clear whether this level of exposure would cause observable effects in fish or aquatic invertebrates.

The gross responses of most species of algae are likely to resemble those of fish and aquatic invertebrates. Sensitive species, however, might show evidence of marked growth inhibition even at the lowest application rate. The effects of Roundup or other glyphosate formulations, however, would probably be similar (i.e., Roundup does not seem to be more toxic than other glyphosate formulations are to algae).

These conclusions, for the most part, are consistent with available field studies, as summarized in Table 4-6. At or near the typical application rate of 1 lb a.i./acre, Rodeo has not been associated with adverse effects in aquatic invertebrates (Henry et al. 1994, Solberg and Higgins 1993). As indicated in Table 4-6, the cause of the decreased abundance of aquatic invertebrates noted by Solberg and Higgins (1993) could not be determined. Field studies at higher application rates have not been encountered.

At an application rate 1.8 lbs a.i./acre, Roundup has been associated with signs of irritation in caged trout and an increase in stream drift of some invertebrates (Kreutzweiser et al. 1989, Reynolds et al. 1993). No frank signs of toxicity were noted. The peak level of glyphosate noted in this study was about 0.1 mg/L, the reference concentration for glyphosate from Roundup.

The study by Sullivan et al. (1981) is difficult to interpret. The investigators monitored the population of several different species of algae over a relatively long period and could not differentiate between the effects of treatment and seasonable changes. Nonetheless, this study is consistent with the above risk characterization in that substantial effects attributed to treatment could not be detected and would not be expected from the dose-response and exposure assessments.

Table 4-6. Field studies on glyphosate useful for the risk assessment of aquatic species

Formulation/ Application	Observations	Reference
Roundup, 2 lbs a.i./acre, aerial or manual spray boom	No clear effects associated with treatment over a 47-day observation period. Several variations in different species of algae were noted in a pond and in streams. Changes occurring in the streams were attributed to seasonal changes rather than treatment. Changes seen in algal species in the pond could not be clearly associated with treatment.	Sullivan et al. 1981
Roundup, 2.0 kg/ha [1.8 lbs a.i./acre], aerial	None of the post-spray drift volumes of most invertebrates were significantly higher than pre-spray values. A transient increase was seen for <i>Gammarus</i> (scud)—2-fold—and <i>Paraleptophlebia</i> (mayfly)—11-fold—species. This effect could not be unequivocally linked to treatment. Stressed behavior in caged coho salmon and an apparent decrease in the abundance of juvenile coho salmon were observed.	Kreutzweiser et al. 1989, Reynolds et al. 1993
Rodeo, 2.8 L/ha [1.3 kg/ha or 1.2 lbs a.i./acre], aerial	Treatment was effective in killing cattails on the treated wetland. The abundance of aquatic invertebrates decreased, the cause of which (migration or mortality) could not be determined.	Solberg and Higgins 1993
Rodeo, 0.1531 kg a.i./L -5.8 L/ha [0.9 kg/ha or 0.8 lbs a.i./acre], aerial	Water pH of 6.4-10.7 (mean=8). No significant differences in mortality rates for aquatic invertebrates (leeches, amphipods, snail, and midges) were observed over a 1-21 day observation period.	Henry et al. 1994

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Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Roundup Pro	rainbow trout	NS	96 hours	LC ₅₀ = 8.3 ppm		Matura 1996a
Roundup Pro	bluegill sunfish	NS	96 hours	LC ₅₀ = 6.5 ppm		Matura 1996a
Roundup	rainbow trout	static bioassay	24 hours 96 hours	LC ₅₀ = 8.3 ppm LC ₅₀ = 8.3 ppm	(7.0-9.9 ppm) 12°C (54°F) (7.0-9.9 ppm) 12°C (54°F)	Folmar et al. 1979
Roundup	fathead minnow	static bioassay	24 hours 96 hours	LC ₅₀ = 2.4 ppm LC ₅₀ = 2.3 ppm	(2.0-2.9 ppm) 22°C (72°F) (1.9-2.8 ppm) 22°C (72°F)	Folmar et al. 1979
Roundup	channel catfish	static bioassay	24 hours 96 hours	LC ₅₀ = 13 ppm LC ₅₀ = 13 ppm	(11-16 ppm) 22°C (72°F) (11-16 ppm) 22°C (72°F)	Folmar et al. 1979
Roundup	bluegill	static bioassay	24 hours 96 hours	LC ₅₀ = 6.4 ppm LC ₅₀ = 5.0 ppm	(4.8-8.6 ppm) 22°C (72°F) (3.8-6.6 ppm) 22°C (72°F)	Folmar et al. 1979
Roundup	rainbow trout eyed eggs	static bioassay	24 hours 96 hours	LC ₅₀ = 46 ppm LC ₅₀ = 16 ppm	(35-61 ppm) (13-19 ppm)	Folmar et al. 1979
Roundup	rainbow trout sac fry	static bioassay	24 hours 96 hours	LC ₅₀ = 11 ppm LC ₅₀ = 3.4 ppm	(8.8-13 ppm) (2.2-5.3 ppm)	Folmar et al. 1979
Roundup	rainbow trout swim-up fry	static bioassay	24 hours 96 hours	LC ₅₀ = 2.4 ppm LC ₅₀ = 2.4 ppm	(2.0-2.9 ppm) (2.0-2.9 ppm)	Folmar et al. 1979
Roundup	rainbow trout fingerling (1.0 g)	static bioassay	24 hours 96 hours	LC ₅₀ = 2.2 ppm LC ₅₀ = 1.3 ppm	(0.93-5.2 ppm) (1.1-1.6 ppm)	Folmar et al. 1979
Roundup	rainbow trout fingerling (2.0 g)	static bioassay	24 hours 96 hours	LC ₅₀ = 8.3 ppm LC ₅₀ = 8.3 ppm	(7.0-9.9 ppm) (7.0-9.9 ppm)	Folmar et al. 1979
Roundup	channel catfish eyed eggs	static bioassay	24 hours 96 hours	LC ₅₀ = 43 ppm LC ₅₀ = ND	(36-51 ppm) ND	Folmar et al. 1979
Roundup	channel catfish sac fry	static bioassay	24 hours 96 hours	LC ₅₀ = 4.3 ppm LC ₅₀ = 4.3 ppm	(3.6-5.1 ppm) (3.6-5.1 ppm)	Folmar et al. 1979
Roundup	channel catfish swim-up fry	static bioassay	24 hours 96 hours	LC ₅₀ = 3.7 ppm LC ₅₀ = 3.3 ppm	(3.4-4.1 ppm) (2.8-3.9 ppm)	Folmar et al. 1979
Roundup	channel catfish fingerling (2.2 g)	static bioassay	24 hours 96 hours	LC ₅₀ = 13 ppm LC ₅₀ = 13 ppm	(11-16 ppm) (11-16 ppm)	Folmar et al. 1979
Roundup	rainbow trout fingerling (1.4 g)	static bioassay (laboratory)	96 hours	LC ₅₀ = 54.8 ppm	(50-60 ppm)	Hildebrand et al. 1982

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Roundup	rainbow trout fingerling (1.6 g)	static bioassay (field)	96 hours	LC ₅₀ = 52 ppm	not reported	Hildebrand et al. 1982
Roundup	rainbow trout fingerling (2.1 g)	manual application	1 hour	100% survival; short period (15 minutes) of increased swimming activity during and shortly after application; no acute manifestations of physical discomfort such as coughing or loss of equilibrium	indigenous cutthroat trout and caddis fly larvae in pools along the stream course did not show signs of stress during the period of spraying	Hildebrand et al. 1982
Roundup	rainbow trout fingerling (2.3 g)	aerial application	NS	100% survival; no obvious signs of physical stress or discomfort from the time of spraying to conclusion of study (17 days)	no indication of stressful behavior by fish after first rainfall	Hildebrand et al. 1982
Roundup	rainbow trout	static bioassay	96 hours	LC ₅₀ = 26 ppm	(12-38 ppm) 11 °C	Mitchell et al. 1987a
Roundup	chinook salmon	static bioassay	96 hours	LC ₅₀ = 20 ppm	(17-27 ppm) 11 °C	Mitchell et al. 1987a
Roundup	coho salmon	static bioassay	96 hours	LC ₅₀ = 22 ppm	(12-38 ppm) 11 °C	Mitchell et al. 1987a
Roundup	bluegill	not reported	96 hours	TL ₅₀ = 14 ppm	none	Monsanto Co. 1982b
Roundup	carp	not reported	96 hours	TL ₅₀ = 3.9 ppm	none	Monsanto Co. 1982b
Roundup	trout	not reported	96 hours	TL ₅₀ = 11 ppm	none	Monsanto Co. 1982b
Roundup	catfish	not reported	96 hours	LC ₅₀ = 16 ppm	none	Monsanto Co. 1982b
Roundup	fathead minnow	not reported	96 hours	LC ₅₀ = 9.4 ppm	none	Monsanto Co. 1982b
Roundup	rainbow trout	not reported	96 hours	TL ₅₀ = 48 ppm	none	USDA 1981

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Roundup	bluegill	not reported	96 hours	TL ₅₀ = 24 ppm	none	USDA 1981
Roundup	rainbow trout	static bioassay	24 hours 96 hours	LC ₅₀ = 8.3 mg/L LC ₅₀ = 8.3 mg/L	none	Folmar et al. 1979
Roundup	channel catfish	static bioassay	24 hours 96 hours	LC ₅₀ = 13 mg/L LC ₅₀ = 13 mg/L	none	Folmar et al. 1979
Roundup	bluegill	static bioassay	24 hours 96 hours	LC ₅₀ = 6.4 mg/L LC ₅₀ = 5.0 mg/L	none	Folmar et al. 1979
Roundup	bleak	static bioassay	96 hours	LC ₅₀ = 16 ppm	(15-18 ppm)	Linden et al. 1979
Roundup	harpacticoid	static bioassay	96 hours	LC ₅₀ = 22 ppm	(17-29 ppm)	Linden et al. 1979
Roundup	coho salmon smolts	sublethal exposure	10 days	no affect on seawater adaptation: plasma sodium values not significantly different from control	there was no effect on growth and several sublethal parameters at exposure concentrations up to 2.78 ppm	Mitchell et al. 1987b
Roundup	grass carp	intermittent dosing	24 hours	LC ₅₀ = 26 ppm	(22-30 ppm) 18-21°C; pH 8.1; hardness 270 mg/L	Tooby et al. 1980
			48 hours	LC ₅₀ = 24 ppm	(21-28 ppm) 18-21°C; pH 8.1; hardness 270 mg/L	
			96 hours	LC ₅₀ = 15 ppm	(13-18 ppm) 18-21°C; pH 8.1; hardness 270 mg/L	
Roundup	sockeye (fingerling)	static bioassay	96 hours	LC ₅₀ = 26.7 ppm	4.2°C; pH 7.95; average weight 3.8 g	Servizi et al. 1987
Roundup	sockeye (fingerling)	static bioassay	96 hours	LC ₅₀ = 27.7 ppm	4.2°C; pH 8.0; average weight 3.7 g	Servizi et al. 1987
Roundup	sockeye (fry)	static bioassay	96 hours	LC ₅₀ = 28.8 ppm	4.5°C; pH 7.7; average weight 0.25 g	Servizi et al. 1987
Roundup	rainbow trout (fry)	static bioassay	96 hours	LC ₅₀ = 28.0 ppm	15°C; pH <6.3; average weight 0.33 g	Servizi et al. 1987
Roundup	rainbow trout (fry)	static bioassay	96 hours	LC ₅₀ = 25.5 ppm	14.5°C; pH <6.3; average weight 0.60 g	Servizi et al. 1987

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Roundup	coho salmon (fry)	static bioassay	96 hours	LC ₅₀ = 42.0 ppm	15 °C; pH <6.3; average weight 0.30 g	Servizi et al. 1987
Roundup	coho salmon (juvenile)	static bioassay	96 hours	LC ₅₀ = 31 ppm	14 °C; intermediate pH	Wan et al. 1991
Roundup	pink salmon (juvenile)	static bioassay	96 hours	LC ₅₀ = 10 ppm	14 °C; intermediate pH	Wan et al. 1991
Roundup	rainbow trout (juvenile)	static bioassay	96 hours	LC ₅₀ = 31 ppm	14 °C; intermediate pH	Wan et al. 1991
Rodeo	carp	not reported	96 hours	TL ₅₀ >10,000	none	Monsanto Co. 1982d
Rodeo	trout	not reported	96 hours	TL ₅₀ >1000	none	Monsanto Co. 1982d
Rodeo	bluegill	not reported	96 hours	TL ₅₀ >1000	none	Monsanto Co. 1982d
Rodeo	plains minnow	renewal	96 hours	NOAEC = 1000 mg/L	none	Beyers 1995
Rodeo	fathead minnow	renewal	96 hours	NOAEC = 1000 mg/L	none	Beyers 1995
Rodeo	rainbow trout (0.52 g)	static bioassay	96 hours	LC ₅₀ = 1100	(850-1300 ppm) 11 °C; pH 6.0; hardness 5.0 mg/L	Mitchell et al. 1987a
Rodeo/X-77 ^b)	rainbow trout (0.52 g)	static bioassay	96 hours	LC ₅₀ = 680 ppm	(600-820 ppm) 11 °C; pH 6.0; hardness 5.0 mg/L	Mitchell et al. 1987a
Rodeo/X-77 ^b)	rainbow trout (0.21 g)	static bioassay	96 hours	LC ₅₀ = 1070 ppm	(600-1920 ppm) 11 °C; pH 7.8; hardness 75 mg/L	Mitchell et al. 1987a
Rodeo/X-77 ^b)	chinook salmon (4.2 g)	static bioassay	96 hours	LC ₅₀ = 750 ppm	(600-1100 ppm) 11 °C; pH 5.8; hardness 5.0 mg/L	Mitchell et al. 1987a
Rodeo/X-77 ^b)	chinook salmon (5.9 g)	static bioassay	96 hours	LC ₅₀ = 1440 ppm	(1070-1920 ppm) 11 °C; pH 7.4; hardness 77 mg/L	Mitchell et al. 1987a
Rodeo/X-77 ^b)	coho salmon (17.9 g)	static bioassay	96 hours	LC ₅₀ = 1000 ppm	(600-1900 ppm) 11 °C; pH 5.8; hardness 5.0 mg/L	Mitchell et al. 1987a
Rodeo/X-77 ^b)	coho salmon (11.8 g)	static bioassay	96 hours	LC ₅₀ = 600 ppm	(340-1100 ppm) 11 °C; pH 6.2; hardness 4.5 mg/L	Mitchell et al. 1987a

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Glyphosate (IPA salt in Rodeo)	rainbow trout (0.52 g)	static bioassay	96 hours	LC ₅₀ = 580	(460-730 ppm) 11 °C; pH 6.0; hardness 5.0 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Roundup)	rainbow trout (0.37 g)	static bioassay	96 hours	LC ₅₀ = 12 ppm	(5.7-18 ppm) 11 °C; pH 6.1; hardness 4.5 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Roundup)	rainbow trout (0.37 g)	static bioassay	96 hours	LC ₅₀ = 11 ppm	(5.7-18 ppm) 11 °C; pH 7.6; hardness 85 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Roundup)	rainbow trout (0.37 g)	static bioassay	96 hours	LC ₅₀ = 7.4 ppm	(5.7-10 ppm) 11 °C; pH 7.7; hardness 81 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Roundup)	chinook salmon (4.6 g)	static bioassay	96 hours	LC ₅₀ = 9.6 ppm	(7.9-13 ppm) 11 °C; pH 6.1; hardness 4.5 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Roundup)	coho salmon (11.8 g)	static bioassay	96 hours	LC ₅₀ = 11 ppm	(5.7-18 ppm) 11 °C; pH 6.2; hardness 4.5 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Rodeo/X-77 ^b)	rainbow trout (0.52 g)	static bioassay	96 hours	LC ₅₀ = 130 ppm	(120-160 ppm) 11 °C; pH 6.0; hardness 5.0 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Rodeo/X-77 ^b)	rainbow trout (0.21 g)	static bioassay	96 hours	LC ₅₀ = 210 ppm	(120-380 ppm) 11 °C; pH 7.8; hardness 75 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Rodeo/X-77 ^b)	chinook salmon (4.2 g)	static bioassay	96 hours	LC ₅₀ = 140 ppm	(120-220 ppm) 11 °C; pH 5.8; hardness 5.0 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Rodeo/X-77 ^b)	chinook salmon (5.9 g)	static bioassay	96 hours	LC ₅₀ = 290 ppm	(210-380 ppm) 11 °C; pH 7.4; hardness 77 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Rodeo/X-77 ^b)	coho salmon (17.9 g)	static bioassay	96 hours	LC ₅₀ = 200 ppm	(120-370 ppm) 11 °C; pH 5.8; hardness 5.0 mg/L	Mitchell et al. 1987a
Glyphosate (IPA salt in Rodeo/X-77 ^b)	coho salmon (11.8 g)	static bioassay	96 hours	LC ₅₀ = 120 ppm	(68-220 ppm) 11 °C; pH 6.2; hardness 4.5 mg/L	Mitchell et al. 1987a
Glyphosate	sockeye (fingerling)	static bioassay	96 hours	LC ₅₀ = 8.1 ppm	4.2 °C; pH 7.95; average weight 3.8 g	Servizi et al. 1987

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Glyphosate	sockeye (fingerling)	static bioassay	96 hours	LC ₅₀ = 8.4 ppm	4.2°C; pH 8.0; average weight 3.7 g	Servizi et al. 1987
Glyphosate	sockeye (fry)	static bioassay	96 hours	LC ₅₀ = 8.7 ppm	4.5°C; pH 7.7; average weight 0.25 g	Servizi et al. 1987
Glyphosate	rainbow trout (fry)	static bioassay	96 hours	LC ₅₀ = 8.5 ppm	15°C; pH <6.3; average weight 0.33 g	Servizi et al. 1987
Glyphosate	rainbow trout (fry)	static bioassay	96 hours	LC ₅₀ = 7.8 ppm	14.5°C; pH <6.3; average weight 0.60 g	Servizi et al. 1987
Glyphosate	coho salmon (fry)	static bioassay	96 hours	LC ₅₀ = 12.8 ppm	15°C; pH <6.3; average weight 0.30 g	Servizi et al. 1987
Glyphosate	rainbow trout	static bioassay	96 hours	LC ₅₀ = 10.42 ppm	(9.37-11.67) 12°C; pH 6.01; hardness 9.6 mg/L	Morgan and Kiceniuk 1992
Glyphosate	rainbow trout	static bioassay	24 hours 96 hours	LC ₅₀ = 140 ppm LC ₅₀ = 140 ppm	(120-170 ppm) 12°C (54°F) (120-170 ppm) 12°C (54°F)	Folmar et al. 1979
Glyphosate	fathead minnow	static bioassay	24 hours 96 hours	LC ₅₀ = 97 ppm LC ₅₀ = 97 ppm	(79-120 ppm) 22°C (72°F) (79-120 ppm) 22°C (72°F)	Folmar et al. 1979
Glyphosate	channel catfish	static bioassay	24 hours 96 hours	LC ₅₀ = 130 ppm LC ₅₀ = 130 ppm	(110-160 ppm) 22°C (72°F) (110-160 ppm) 22°C (72°F)	Folmar et al. 1979
Glyphosate	bluegill	static bioassay	24 hours 96 hours	LC ₅₀ = 150 ppm LC ₅₀ = 140 ppm	(120-190 ppm) 22°C (72°F) (120-190 ppm) 22°C (72°F)	Folmar et al. 1979
Glyphosate	rainbow trout fry	not reported	96 hours	LC ₅₀ = 50 ppm	3 lbs a.e./gallon	Folmar 1976
Glyphosate	bleak	not reported	96 hours	LC ₅₀ = 16 ppm	(15-18 ppm) 10°C (50°F)	Linden et al. 1979
Glyphosate (95% pure)	flagfish	pulse exposure	96 hours	LC ₂₀ = 29.6 ppm	fed 8-day-old flagfish	Holdway and Dixon 1988
Glyphosate, technical	rainbow trout	not reported	96 hours	TL ₅₀ = 38 ppm	none	USDA 1981
Glyphosate, technical	bluegill	not reported	96 hours	TL ₅₀ = 78 ppm	none	USDA 1981
Glyphosate, technical	bluegill	dynamic test	96 hours	TL ₅₀ = 24 ppm	none	USDA 1981

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Glyphosate, technical	bluegill	not reported	96 hours	LC ₅₀ = 120 ppm	none	Monsanto Co. 1982a
Glyphosate, technical	trout	not reported	96 hours	LC ₅₀ = 86 ppm	none	Monsanto Co. 1982a
Glyphosate, technical	carp	not reported	96 hours	LC ₅₀ = 115 ppm	none	Monsanto Co. 1982a
Glyphosate, technical	harlequin fish	not reported	96 hours	LC ₅₀ = 168 ppm	none	Monsanto Co. 1982a
Glyphosate, technical	carp	static bioassay	48 hours	TL ₅₀ = 119 ppm TL ₁ = 146 ppm TL ₉₉ = 96.7 ppm	none	USDA 1981
Glyphosate, technical	carp	static bioassay	96 hours	TL ₅₀ = 115 ppm TL ₁ = 125 ppm TL ₉₉ = 105 ppm	none	USDA 1981
Glyphosate, technical	rainbow trout	static bioassay	96 hours	LC ₅₀ = 25,605 mg/L NOEC = 8,000 mg/L	36% active ingredient	Anton et al. 1994
Glyphosate, technical	rainbow trout	static bioassay	96 hours	LC ₅₀ = 25,657 mg/L NOEC = NR	38% active ingredient	Anton et al. 1994
Glyphosate, technical	rainbow trout	static bioassay	96 hours	LC ₅₀ = 7,620 mg/L NOEC = 6,250 mg/L	54.9% active ingredient	Anton et al. 1994
Glyphosate, technical	goldfish	static bioassay	96 hours	LC ₅₀ = 7,816 mg/L NOEC = 1,500 mg/L	54.9% active ingredient	Anton et al. 1994
Vision-10% surfactant	coho salmon	closed system respirometer	4 hours	hematocrit significantly increased over controls at lowest (3.75 and 60 ppm) concentrations (p<0.05) but expected to decrease as a result of stress; no significant increases in plasma lactate or plasma glucose	data suggest that a stress threshold was not reached for Vision-10% surfactant at concentrations up to 80% of the 96-hour LC ₅₀	Janz et al. 1991

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Vision	rainbow trout	sublethal exposure	1 month	fish in highest concentration (45.75 µg/L) had significantly higher frequency of wigwags	little overall effect of exposure to Vision on rainbow trout	Morgan and Kiceniuk 1992
Vision	rainbow trout	sublethal exposure	2 months	fish in lowest concentration (4.25 µg/L) performed significantly fewer wigwags	little overall effect of exposure to Vision on rainbow trout; it is not clear what the implications of a change in one agonistic activity in the repertoire of aggressive behavior would be in terms of fish's ability to hold a feeding station	Morgan and Kiceniuk 1992
MONO818	sockeye (fingerling)	static bioassay	96 hours	LC ₅₀ = 4.0 ppm	4.2°C; pH 7.95; average weight 3.8 g	Servizi et al. 1987
MONO818	sockeye (fingerling)	static bioassay	96 hours	LC ₅₀ = 4.2 ppm	4.2°C; pH 8.0; average weight 3.7 g	Servizi et al. 1987
MONO818	sockeye (fry)	static bioassay	96 hours	LC ₅₀ = 4.3 ppm	4.5°C; pH 7.7; average weight 0.25 g	Servizi et al. 1987
MONO818	rainbow trout (fry)	static bioassay	96 hours	LC ₅₀ = 4.2 ppm	15°C; pH <6.3; average weight 0.33 g	Servizi et al. 1987
MONO818	rainbow trout (fry)	static bioassay	96 hours	LC ₅₀ = 3.8 ppm	14.5°C; pH <6.3; average weight 0.60 g	Servizi et al. 1987
MONO818	coho salmon (fry)	static bioassay	96 hours	LC ₅₀ = 6.3 ppm	15°C; pH <6.3; average weight 0.30 g	Servizi et al. 1987
Glyphosate	rainbow trout	static bioassay	96 hours	LC ₅₀ = 10.42 ppm	(9.37-11.67) 12°C; pH 6.01; hardness 9.6 mg/L	Morgan and Kiceniuk 1992
Surfactant used in Roundup	rainbow trout	static bioassay	24 hours 96 hours	LC ₅₀ = 2.1 ppm LC ₅₀ = 2.0 ppm	(1.6-2.7 ppm) 12°C (54°F) (1.5-2.7 ppm) 12°C (54°F)	Folmar et al. 1979
Surfactant used in Roundup	fathead minnow	static bioassay	24 hours 96 hours	LC ₅₀ = 1.4 ppm LC ₅₀ = 1.0 ppm	(1.2-1.7 ppm) 22°C (72°F) (1.2-1.7 ppm) 22°C (72°F)	Folmar et al. 1979
Surfactant used in Roundup	channel catfish	static bioassay	24 hours 96 hours	LC ₅₀ = 18 ppm LC ₅₀ = 13 ppm	(8.5-38 ppm) 22°C (72°F) (10-17 ppm) 22°C (72°F)	Folmar et al. 1979

Appendix 2-3. Toxicity of glyphosate and glyphosate formulations to fish

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Surfactant used in Roundup	bluegill	static bioassay	24 hours	LC ₅₀ = 3.0 ppm	(2.5-3.7 ppm) 22°C (72°F)	Folmar et al. 1979
			96 hours	LC ₅₀ = 3.0 ppm	(2.5-3.7 ppm) 22°C (72°F)	

^aValues in parentheses are the 95% confidence limits.

^bRodeo /X-77 consists of 312 mL Rodeo mixed with 699 mL water and 4 mL X-77 surfactant.

NOEC = No-observed-effect concentration; NOAEC = No-observed-acute-effect concentration; ND = not determined

Appendix 2-4. Acute toxicity of glyphosate to aquatic invertebrates

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Glyphosate	midge larvae (<i>Chironomus plumosus</i> ; insecta)		48 hours	EC ₅₀ = 55 ppm	(31-97 ppm) 22°C (72°F)	Folmar et al. 1979
Roundup surfactant	midge larvae (<i>Chironomus plumosus</i> ; insecta)		48 hours	EC ₅₀ = 13 ppm	(7.1-24 ppm) 22°C (72°F)	Folmar et al. 1979
Glyphosate, technical	grass shrimp (crustacea)		96 hours	TL ₅₀ = 281 ppm NOEL at 210 ppm	(207-391 ppm)	Monsanto Co. 1982a, USDA 1981
Glyphosate, technical	fiddler crab (crustacea)		96 hours	TL ₅₀ = 934 ppm NOEL at 650 ppm	(555-1570 ppm)	Monsanto Co. 1982a, USDA 1981
Roundup	red swamp crawfish (<i>Procambarus clarkii</i>)		96	LC ₅₀ = 47.31 ppm	(41.06-51.69)	Holck and Meek 1987
Roundup	fourth instar <i>Anopheles quadrimaculatus</i> larvae	combination of techniques	24	LC ₅₀ = 673.43 ppm	(572.57-770.17)	Holck and Meek 1987
Roundup	fourth instar <i>Psuropora columbiae</i> larvae	combination of techniques	24	LC ₅₀ = 940.84 ppm	(823.08-1067.12)	Holck and Meek 1987
Roundup	fourth instar <i>Culex salinarius</i> larvae	combination of techniques	24	LC ₅₀ = 1563.69 ppm	(1262.00-2214.54)	Holck and Meek 1987
Roundup	cladoceran (<i>Daphnia magna</i> ; crustacea)		48 hours	EC ₅₀ = 3.0 ppm	(2.6-3.4 ppm) 22°C (72°F)	Folmar et al. 1979
Roundup	cladoceran (<i>Daphnia pulex</i> ; crustacea)	basic static test with suspended sediment	48 hours	EC ₅₀ = 3.2 ppm	(3.0-3.4 ppm) 22°C (72°F)	Hartman and Martin 1984
Roundup	cladoceran (<i>Daphnia pulex</i> ; crustacea)	basic static test without suspended sediment	48 hours	EC ₅₀ = 7.9 ppm	(7.2-8.6 ppm) 22°C (72°F)	Hartman and Martin 1984
Roundup	cladoceran (<i>Daphnia</i> sp.; crustacea)		48 hours	LC ₅₀ = 192 ppm	(181-205 ppm)	USDA 1981
Roundup	cladoceran (<i>Daphnia</i> sp.; crustacea)		48 hours	LC ₅₀ = 5.3 ppm	NS	Monsanto Co. 1982b
Roundup Pro	cladoceran (<i>Daphnia magna</i> ; crustacea)		48 hours	LC ₅₀ = 8.9 ppm		Matura 1996a

Appendix 2-4. Acute toxicity of glyphosate to aquatic invertebrates

Formulation	Species	Nature of Exposure	Exposure Time	Effects	Comments ^a	Reference
Rodeo	cladoceran (<i>Daphnia</i> sp.; crustacea)		48 hours	LC ₅₀ = 930 ppm	NS	Monsanto Co. 1982d
Rodeo	<i>Daphnia magna</i>	static bioassay	48 hours	LC ₅₀ = 218 ppm	(150-287 ppm)	Henry et al. 1994
Rodeo	<i>Hyalella azteca</i>	static bioassay	96 hours	LC ₅₀ = 720 ppm ^b	(399-1076 ppm)	Henry et al. 1994
Rodeo	<i>Chironomus riparius</i>	static bioassay	48 hours	LC ₅₀ = 1216 ppm ^b	(996-1566 ppm)	Henry et al. 1994
Rodeo	<i>Nepheleopsis obscura</i>	static bioassay	96 hours	LC ₅₀ = 1177 ppm ^b	(941-1415 ppm)	Henry et al. 1994
Glyphosate, technical	cladoceran (<i>Daphnia</i> sp.; crustacea)		40 hours	LC ₅₀ = 780 ppm	NS	Monsanto Co. 1982a
Glyphosate, technical	larval Atlantic oysters (mollusca)		48 hours	NOEL at 10 ppm	no effect on embryonic development of larvae	Monsanto Co. 1982a, USDA 1981
Glyphosate	snails (<i>Pseudosuccinea columella</i>)	snails reared in sublethal concentrations	4 weeks	biochemical alteration	increased protein concentration of snails reared in 1.0 mg/L compared with those reared in 0.1 mg/L; exact mechanism for response not determined	Christian et al. 1993
Roundup	amphipod (<i>Gammarus pseudolimnaeus</i> ; crustacea)		48 hours 96 hours	LC ₅₀ = 62 ppm LC ₅₀ = 43 ppm	(40-98 ppm) 12°C (54°F) (28-66 ppm) 12°C (54°F)	Folmar et al. 1979
Roundup	crayfish (crustacea)		96 hours	LC ₅₀ >1000 ppm	NS	Monsanto Co. 1982b
Roundup	Harpacticoid (<i>Nitocra spinipes</i> ; crustacea)		96 hours	LC ₅₀ = 22 ppm	(17-29 ppm) 21.1°C (70 ± 2°F)	Linden et al. 1979

^aValues in parentheses are the 95% confidence limits.

^bOnly 50% of the test organisms were killed in the highest concentration tested.

NS = Not specified.

Appendix 2-5: Toxicity of glyphosate and glyphosate formulations to aquatic plants

Species	Endpoint	Reference
<u>Glyphosate</u>		
<i>Selenastrum capricornutum</i> , green algae	4 day EC ₅₀ = 12.5 mg/L	U.S. EPA 1993b
<i>Navicula pelliculosa</i> , diatom	4 day EC ₅₀ = 39.9 mg/L	
<i>Skeletonema costatum</i> ,	4 day EC ₅₀ = 0.85 mg/L	Maule and Wright 1984
<i>Anabaena flosaquae</i> , cyanobacter	4 day EC ₅₀ = 11.7 mg/L	
<i>Lemna gibba</i> , duckweed	7 day EC ₅₀ = 11.7 mg/L	
<i>Chlorella pyrenoidosa</i> , green algae	4 day EC ₅₀ = 590 mg/L	
<i>Chlorococcum hypnosporum</i> , green algae	4 day EC ₅₀ = 68 mg/L	
<i>Zygnema cllindricum</i> , green algae	4 day EC ₅₀ = 88 mg/L	Peterson et al. 1994 [Inhibition of carbon fixation after 24 hours. Negative values indicate stimulation.]
<i>Anabaena flosaquae</i> , cyanobacter	4 day EC ₅₀ = 304 mg/L	
<i>Cyclotella meneghiana</i> , green algae	73% inhibition at 2.8 mg/L	
<i>Nitzschia sp.</i> , green algae	77% inhibition at 2.8 mg/L	
<i>Scenedesmus quadricauda</i> , green algae	3% inhibition at 2.8 mg/L	
<i>Selenastrum capricornutum</i> , green algae	18% inhibition at 2.8 mg/L	
<i>Microcystis aeruginosa</i> , cyanobacter	-41% inhibition at 2.8 mg/L	
<i>Microcystis aeruginosa</i> , cyanobacter	16% inhibition at 2.8 mg/L	
<i>Oscillatoria sp.</i> , cyanobacter	-12% inhibition at 2.8 mg/L	
<i>Pseudoanabaena sp</i> , cyanobacter	12% inhibition at 2.8 mg/L	
<i>Anabaena inaequalis</i> , cyanobacter	11% inhibition at 2.8 mg/L	
<i>Aphanizomenon flos-aquae</i> , cyanobacter	74% inhibition at 2.8 mg/L	
<i>Lemna minor</i> , duckweed	no inhibition at 2.8 mg/L over 5 days	
<u>Roundup</u>		
Mixed colonies of periphytic aglae	4 hour EC ₅₀ s = 35.4-44.4 mg/L for inhibition of photosynthesis. NOEC = 0.89 mg/L.	Goldsborough and Brown 1989

ATTACHMENT 5: Water Quality Effects of Three Dust Abatement Compounds

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May 15, 1996

Abstract

Dust abatement compounds are applied occasionally and annually to National Forest roads to control dust and for surface stabilization. However, little is known about the effects to water quality and fishes from using these compounds on a limited basis. A literature review concluded that the use of calcium and magnesium chloride is not without some environmental effects. The chloride ion stays in solution and it is the chloride that exhibits toxicity towards plants and animals. In areas where high concentrations of salts are used for winter time deicing and dust abatement, typically in the northeastern United States, is where cumulative effects are most noticeable. For the purposes that the agency uses these compounds, little environmental effects are anticipated. Ugninsulfonate is highly stable in the environment, however it is also water soluble. Fish have high tolerance to ligninsulfonates. The greatest concern in using this product is that it increases the biochemical oxygen demand to receiving waters which may result in reduced productivity and even fish kills.

Calcium and Magnesium Chloride

Chemical Properties

Calcium and magnesium chloride are simple salts that can be found in natural brine deposits within the earth. Their chemical formulas are CaCl_2 and MgCl_2 respectively. Calcium chloride is available commercially as a solid (flakes or pellets) and calcium and magnesium chloride are available as a colorless, odorless liquid. Calcium chloride is a by-product of soda-ash manufacturing and magnesium chloride is produced from natural sea water. They are both able to adsorb moisture from the air (deliquescence) and hold this moisture as a liquid for a long period of time by resisting evaporation (hygroscopicity). Calcium and magnesium chloride cease to adsorb moisture from the air when the humidity falls below 30 to 40 percent (Langdon et. 1980). However, magnesium chloride appears to work better in desert regions, whereas calcium chloride may work better in higher altitudes with more rain (Idaho Department of environmental Quality Fact Sheet). Calcium and magnesium chloride will completely dissociate in excess water into its constituent ions of Ca^{2+} , Mg^{2+} and Cl^- .

Movement Through The Soil

Calcium and magnesium chloride move through the soil with water. In other words, they are highly soluble. Their movement is largely dependent upon the rate and frequency of rainfall, the drainage characteristics of the area of application and chemical and physical nature of the soil.

In periods of light rainfall, calcium and magnesium chloride remain as hydrated complexes and move vertically with soil surface moisture. During wet periods, they will move deeper into the soil strata, whereas during periods of evaporation they will again move towards the surface. Because of their deliquescence, calcium and magnesium chloride remain as a liquid under these conditions and stay dispersed within the top few inches of the soil.

Lateral movement of calcium and magnesium chloride does occur but at much slower rate. One study, using an unpaved sandy clay test road, showed that after a 55 month weathering period,

calcium chloride was detected at 24 inches from the edge of the road section, only 4.1 percent of the original amount that was applied to the road surface. Another study, using a coarse-textured base and fine-textured subgrade, found it 12 inches away from the edge of the road section after a 2.5 month weathering period. The application concentrations used for the previous studies is unknown and no information for rainfall conditions was presented. Although, chloride solutions tend to move through soils at virtually the same speed as the wetting front (Martin 1989). Based on the above information, it could be expected for calcium chloride to move laterally about 6 inches a year.

However, with rainfalls of higher duration and/or intensity, or in areas with exceptionally high drainage rates (rapid change in topographical elevation, impervious soil or low cation binding capacity soil), calcium and magnesium chloride can move considerable distances either as surface runoff or as soil leachate. Surface runoff typically drains into streams, rivers, ponds or lakes, whereas leachates feed ground-water aquifers. Under these conditions, it is principally the constituent ions, Ca^{2+} , Mg^{2+} and Cl^- , that migrate through the environment.

The Ca^{2+} and Mg^{2+} ions are readily adsorbed by soil particles because most soil colloids carry a net negative charge on their surface and under normal conditions this electrical charge is neutralized by an equivalent amount of oppositely charged cations. Since most soils display a net negative charge, they are quite limited in the anion adsorption capacity. Therefore, Cl^- must compete with the exchangeable anions and cannot effectively displace the bound anions in neutral soils, except at extremely high levels. Chlorides, therefore, will tend to remain in solution and can potentially infiltrate and enter the ground water or drain as runoff into surface waters.

Effects On The Environment

As discussed previously, it is the dissociated calcium, magnesium and chloride ions that migrate through the environment rather than the hydrated calcium and magnesium chloride. Because of its widespread occurrence in rocks, and soils and its ready solubility, calcium and magnesium are present in nearly all waters. Calcium is more abundant than any of the other alkaline-earth metals. The addition of calcium and magnesium from a dust suppressant probably would be insignificant when compared to the amount already present in the environment. Since calcium and magnesium generally will not migrate far from its site of application, except in rare circumstances, its toxicity only pertains to the immediate area around the application site. Chloride is present in all natural waters, although in many areas the amounts are less than 50 parts per million (ppm). Chlorides are also basically unaffected by ion exchange reactions in the soil and thus are capable of widespread movement. Chloride is a common component of both dust suppressants and road deicers. Many studies have been documented about chloride groundwater pollution, mainly from the northeastern United States. Most studies found that concentrations vary from season to season and year to year because more salt is used in the winter and use depends on the severity of the winter. Also, the closer the sampling site was to the highway, the higher the concentrations. The Environmental Protection Agency (EPA) uses 250 ppm as an upper limit for chloride in drinking water in their secondary regulations. Kunkle (1972) found that peak chloride concentrations occurred during the summer dry period, which indicates that some of the road salt found its way into soils, then into subsurface flows, and finally emerged in summer's ground water inputs into the stream. Chloride levels in the streams did not exceed 100 ppm and the mean levels were below 50 ppm. No regulation exists which limits the concentrations of calcium and magnesium found in drinking water, although these ions cause hardness in water (Schwendeman 1981).

Pond and lake contamination has not been extensively studied. However, because of its higher density, the salt will sink to the bottom and stratification could result if little mixing occurs. These bodies of water also, tend to vary in concentration from year to year. The chloride could then leach into the bottom muds and enter the groundwater, contaminating local aquifers. Chloride pollution could also produce anaerobic conditions which could ultimately result in fish kills and interrupt the lake food chain because the bottom feeders are most likely to be affected by chloride contamination.

Toxicity of Chloride to Plants and Fish

The potential toxicity to plants from the use of salts is based on the type of plant and on the amount of exposure to the salt solution. Exposure could occur through direct contact to leaves

and stems or by indirect contact via the plant root zone. Direct contact of plant leaves with the salt adversely affects plants by creating an osmotic imbalance and subsequent dehydration, resulting ultimately in defoliation of the plant. Indirect contact could result in chloride toxicities. Excessive levels of chloride in plant tissues may lead to necrosis, burn of leaf tips and margins, and eventual death. Generally, irrigation and runoff waters containing less than 70 ppm chlorides are safe for most plants. Predicted worst-case chloride levels in runoff from areas receiving calcium or magnesium chloride applications would probably drop to less than 70 ppm within 5 to 30 feet of the application area (Martin 1989).

Some freshwater fish exhibit a great deal of tolerance to salts in general and chloride in particular. One study showed that pike, bass and perch can tolerate chloride levels exceeding 4,000 ppb. Trout, however, could only withstand chloride levels of 400 ppm. Salt concentrations greater than 10,000 ppm place all freshwater species of bacteria, algae, invertebrates, fish and higher plants in immediate jeopardy (Schwendeman 1981).

Conclusions

Based on the literature review it was recognized that calcium and magnesium chloride does have some harmful environmental effects, especially to roadside vegetation. Possible damages that can occur on a yearly and cumulative basis is also recognized. Martin (1989) reported that concentrations of magnesium chloride in a loam soil, after 50 years of consecutive applications at a rate of 1.0 gallon per square yard, would be estimated at 24,609 ppm to a depth of 7 feet. This implies that a water table with an average depth of 20 feet would have a chloride concentration of approximately 197 ppm after 50 years of application. Therefore, the quantity of soluble salts which may enter a shallow water table (less than 25 feet) beneath the area of application after years of repeated treatment may be significant (Martin 1989). Most studies focused on winter time deicing practices where large quantities of salt were used. One study reported that wells that were contaminated with chloride (in excess of 250 ppm) were on average 24 feet away from the highway. Martin (1989) showed that a worst case scenario for a 20 cubic feet per second (cfs) stream results in a chloride concentration of 274.5 ppm in a 24-hour period, which is slightly above the drinking water standard and below the tolerable limits for trout. Typical dust abatement application rate of calcium chloride flake is anywhere from 5 to 7 tons/mile/year at 1.51 lbs per square yard, depending on width of the treated road surface (Langdon et al. 1980; Schwendeman 1981; Moses 1981; Singer et al. 1982). Typical application rate of magnesium chloride, in a brine solution, is usually 0.5 gallons per square yard or 3500 gallons per mile, equating to 18 tons/mile/year (Schwendeman 1981; Martin 1989).

Please keep in mind that the 18 tons/mile/year includes the weight of the water. Since magnesium chloride is in a brine solution and is further diluted with water, a conversion factor was needed in order to make a comparison; 1.5 lbs per square yard of calcium chloride equals 0.4 gallons per square yard of magnesium chloride (Tom Oxford, personal communication). Using this conversion factor and the usual application rate of magnesium chloride, it was determined that 7.5 to 9 tons/mile/year of actual magnesium chloride is applied for dust control purposes.

Typical application rate of sodium chloride, as a road deicer and a solid, is 20 tons/mile/year. More runoff to the shoulder of the road and higher concentrations in drainage areas would be expected when applied to paved roads. At 20 tons/mile/year, the chloride concentrations start to rise above 250 ppm. Usually dust abatement solutions are applied once or twice a year. If applied a second time, the concentration is less than the first application. Singer et al. (1982) noted that the environmental effect following the use of calcium chloride as a dust suppressant should be considerably less than those observed from its use as a road deicer. Therefore, it is unlikely that receiving waters could have concentrations high enough to cause growth or survival problems for fishes. However, avoidance of areas where the treated road segment is within 25 feet of the creek would be expected. The influences from using these dust abatement compounds could be reduced by restricting the use of these compounds within 25 feet of a water body. Martin (1989) found that in areas of shallow ground water (less than 25 feet) there could be a potential for the chloride to move through the soil and encounter the groundwater. Martin (1989) also found that vegetation greater than 25 feet away from the treatment area did not show any signs of stunting.

Ligninsulfonates

Chemical Properties

All tree species are comprised of three major chemical components: cellulose, hemicellulose and lignin. Lignin encompasses a complex group of high molecular weight polymers. As a group, the lignins are second only to cellulose in abundance as natural polymers. Since very few biological agents can degrade the lignin molecule (bacteria can only desulfonate and degrade the smaller aromatic groups in lignin), the molecule is extremely stable environmentally. Fungi seem to be the most active at biodegrading ligninsulfonates.

Pulp and paper mills generate lignin as waste by-product. Of the four major pulping processes used in the United States (kraft, sulfite, semi-chemical and groundwood), only the sulfite (or acid process) generates ligninsulfonates. Wood chips are cooked with salts of sulfurous acid to

remove the lignin. In this process, lignin is solubilized through degradation and sulfonation. The dark solutions containing the degraded ligninsulfonate called spent sulfite liquors (SSL) and the solubilized lignin derivatives are called ligninsulfonates. The SSL also contain appreciable quantities of the naturally occurring wood sugars. Approximately 55 percent of the liquor consists of these polymers, with the remainder composed of sulfurous acid and either Ca-bisulfite, Na-bisulfite, NH₄-bisulfite or Mg-bisulfite and humic acid. If these liquors are to be utilized as dust suppressants, the concentrate is normally available in a 50 percent solid and 50 percent water mixture (Langdon et al. 1980; Schwendeman 1981). Application rates for dust suppression vary, but the most recommended rate was 0.5 gal/yd² of road surface using the 50-50 solution (Van Belle 1977; Langdon et al. 1980; Schwendeman 1981). This equates to about 2.5 lbs/yd², which equals about 10.3 tons/mile.

The Food and Drug Administration (FDA) currently allows for the use of ammonium-, calcium-, magnesium-, and sodium-ligninsulfonates in animal feeds. They may be used as pelleting aids, binding aids or as metabolizable energy, with the provision that the amount does not exceed four percent of the finished product. Liquid ligninsulfonates may also be used as surfactant in molasses for feeds, with the provision that the amount does not exceed 11 percent of the molasses. The FDA also allows for the use of ligninsulfonates and its calcium, potassium and sodium salts as components in paper or paperboard which comes into direct contact with aqueous or fatty foods.

Movement Through The Soil

Unlike lignin, ligninsulfonates are considered water soluble. Like calcium chloride, ligninsulfonates move through the environment with water. With increasing amounts of rainfall, ligninsulfonates are easily washed away. Clay holds the ligninsulfonates more tightly than other soil particles, but not tightly enough to hold them in the presence of passing water flow. Even in regions where annual rainfall is relatively high (60-80 inches) there is good evidence that leaching of ligninsulfonates from stabilized road soils is minor, providing such soils contain enough clay (10-20 percent) to absorb the lignin material (ITT Rayonier Inc. 1973). Schwendeman (1981) reports that soils best suited for ligninsulfonate treatment are those where 70 to 100 percent of the particles pass through a 3/4 inch sieve and 20 to 50 percent are silt or clay. He also reported that in some circumstances the road could become slippery when wet.

Effects On The Environment

Due to their low penetrability through soils, ligninsulfonates pose little, if any, threat to ground water aquifers when applied on the surface. The same would be true for plants. Probably for this reason, little or no studies have been conducted addressing these topics. There are several studies that show where lignin and ligninsulfonates were discharged into waterbodies resulted in pollution problems. Receiving waters exhibited excessive foaming and discoloration with the introduction of ligninsulfonates. This discoloration is theorized to be responsible for reducing the biological activity in the polluted water.

Toxicity of Ligninsulfonates to Fish

When used as a dust suppressant, ligninsulfonate will primarily affect the area in or around the area of application. The exception being the aquatic biota. When introduced into a waterway, ligninsulfonate will increase the biochemical oxygen demand of the water and could impart a light yellow tint to the water (Schwendeman 1981).

A number of studies have been conducted on the toxic effects of pulp effluents. One study

reported toxic effects of sulfite effluents on fish and aquatic organism. As stated earlier, ligninsulfonates only constitutes approximately 55 percent of the waste effluent with the remainder consisting of such materials as acids and bisulfites.

Ligninsulfonates have been shown to exhibit direct toxic effects on rainbow trout. The LC_{50} at 48 hours (concentration of ligninsulfonates which would be lethal to 50% of the test population within 48 hours) was calculated to be 71500 ppm. Other studies for various types of ligninsulfonates calculated the LC_{50} at 96 hours ranging between 2, 125 to 7,300 ppm (Adams 1988). A retarding effect on growth was observed at sublethal concentrations as low as 160 ppm because ligninsulfonates seem to impair the activities of several digestive enzymes.

With respect to other aquatic organisms, biota living in the lower levels of lakes and rivers are likely to be at greater risk from ligninsulfonate pollution. The reasons for this are the effects that they exert on the availability of oxygen. First, the color resulting from the presence of lignin reduces the penetrability of light which subsequently inhibits the photosynthetic activity of algae. Thus, the supply of oxygen to the system is diminished by this reduced activity. Second, due to their negative surface charge, ligninsulfonates adsorb other materials such as proteins that are in the water. The heavier particle that is formed is insoluble and settles to the bottom where it adds to the oxygen demand. If the oxygen demand exceeds the supply, a die-off of those organisms which require oxygen to sustain life may occur.

Conclusions

Except for trout, ligninsulfonates seem to pose little direct systemic toxicity problems in aquatic organisms, animals and humans or any problem with local vegetation. Because of associated microbial slime growths, problems with potable water treatment and unpleasant environmental conditions might occur downstream from an application site. It is recommended to determine if significant migration (water drainage) of ligninsulfonates might occur from the area to be treated into local streams, ponds and lake prior to application. To achieve the most effectiveness from treatment, specific soil aggregate surface is required

Summary

Singer et al. (1982) noted that because there is a greater volume of information on the use and effects of calcium chloride than there is on ligninsulfonates, the use of calcium chloride would be preferred. As most of the environmental problems appear to be associated with pulp and paper mill effluents generally and not with ligninsulfonates specifically, they would not recommend using waste sulfite liquors as dust suppressants. However, Schwendeman (1981) reported that the most environmentally compatible dust palliative is ligninsulfonate. Although, he recommended the use of either calcium or magnesium chloride because of their lower cost.

The British Columbia Ministry of Environment (1990) conducted a study on several road dust abatement chemicals. The results are listed in Table 1. The results of this test indicate that all of the dust abatement compounds evaluated, with the exception of emulsion oil, were in the range of practically non-toxic to non-toxic (LC_{50} of $>1,000$ ppm to $>10,000$ ppm). The Ministry of Environment has no objections to the continued use of these products.

Table 1. Rainbow Trout 96 hour LC_{50} Dust Suppressant Results.

Name	PPM

25% Calcium Chloride	52,000
35% Calcium Chloride	45,000
77% Calcium Chloride Flake	11,000
35% Magnesium Chloride	9,000
Sodium Ligninsulfonate	6,400
Calcium Ligninsulfonate	5,200
Emulsion Oil	200
Sunlight Laundry Detergent	10

References

The majority of the discussion on calcium chloride and ligninsulfonates was taken from Singer et al. (1982). Martin (1989) contributed most of the discussion on magnesium chloride.

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ATTACHMENT 6

SCREEN CRITERIA FOR JUVENILE FISH

JUVENILE FISH

SCREEN CRITERIA

**Developed by
National Marine Fisheries Service
Environmental & Technical Services Division
Portland, Oregon
Revised February 16, 1995**

I. GENERAL CONSIDERATIONS:

This document provides guidelines and criteria to be utilized in the development of functional designs of downstream migrant fish passage facilities for hydroelectric, irrigation, and other water withdrawal projects. This material has been prepared by the National Marine Fisheries Service (NMFS) as a direct result of responsibilities for prescribing fishways (including fish screen and bypass systems) under Section 18 of the Federal Power Act, administered by the Federal Energy Regulatory Commission (FERC). This material is also applicable for projects that are undergoing consultation with the NMFS, pursuant to responsibilities for protecting fish under the Endangered Species Act (ESA).

Since these guidelines and criteria are general in nature, there may be cases where site constraints or extenuating circumstances dictate that certain criteria be waived or modified. Conversely, where there is a need to provide additional protection for fish, site-specific criteria may be added. These circumstances will be considered by NMFS on a project-by-project basis.

In designing an effective fish screen facility, the swimming ability of the fish is a primary consideration. Research has shown that swimming ability of fish varies and may depend upon a number of factors relating to the physiology of the fish, including species, size, duration of swimming time required, behavioral aspects, migrational stage, physical condition and others, in addition to water quality parameters such as dissolved oxygen concentrations, water temperature, lighting conditions, and others. For this reason, screen criteria must be expressed in general terms.

To minimize risks to anadromous fish at some locations, the NMFS may require investigation (by the project sponsors) of important and poorly defined site-specific variables that are deemed critical to development of the screen and bypass design. This investigation may include factors such as fish behavioral response to hydraulic conditions, weather conditions (ice, wind, flooding, etc.), river stage-discharge relationships, seasonal operational variability, potential for sediment and debris problems, resident fish populations, potential for creating predation opportunity, and other information. The size of salmonids present at a potential screen site usually is not known, and can change from year to year based on flow and temperature conditions. Thus, adequate data to describe the size-time relationship requires substantial sampling efforts over a

number of years. The NMFS will assume that fry-sized salmonids and low water temperatures are present at all sites and apply the appropriate criteria listed below, unless adequate biological investigation proves otherwise. The burden-of-proof is the responsibility of the owner of the screen facility.

Proposed facilities which could have particularly significant impacts on fish, and new unproven juvenile fish protection designs, frequently require: 1) development of a biological basis for the concept; 2) demonstration of favorable fish behavioral response in a laboratory setting; 3) an acceptable plan for evaluating the prototype installation; and 4) an acceptable alternate plan developed concurrently for a screen and bypass system satisfying these criteria, should the prototype not adequately protect fish. Additional information on unproven juvenile fish protection devices can be found in "Experimental Fish Guidance Devices," Position Statement of the National Marine Fisheries Service, Northwest Region, January 6, 1995.

Screen and bypass criteria for juvenile salmonids are provided below. Specific exceptions to these criteria occur in the design of small screen and bypass systems (less than 25 cubic feet per second). These are listed in Section K, Modified Criteria for Small Screens.

Striped bass, herring, shad, and other anadromous fish species may have eggs and/or very small fry which are moved with any water current (tides, streamflows, etc.). Installations where these species are present may require special screen and/or bypass facilities, including micro-screens and require individual evaluation of the proposed project. In instances where local regulatory agencies require more stringent screening requirements for species of resident or anadromous fish, the NMFS will generally defer to the more conservative criteria.

II. GENERAL PROCEDURAL GUIDELINES

A functional design should be developed that defines type, location, size, hydraulic capacity, method of operation, and other pertinent juvenile fish screen facility characteristics. In the case of applications to be submitted to the FERC and consultations under the ESA, a functional design for juvenile (and adult) fish passage facilities must be developed and submitted as part of the application. It must reflect the NMFS input and design criteria and be acceptable to the NMFS. Functional design drawings must show all pertinent hydraulic information, including water surface elevations and flows through various areas of the structures. Functional design drawings must show general structural sizes, cross-sectional shapes, and elevations. Types of materials must be identified where they will directly affect fish. The final detailed design shall be based on the functional design, unless changes are agreed to by the NMFS.

All juvenile passage facilities shall be designed to function properly through the full range of hydraulic conditions in the lake, tidal area, or stream and in the diversion, and shall account for debris and sedimentation conditions which may occur.

III. SCREEN CRITERIA FOR JUVENILE SALMONIDS

A. Structure Placement

1. Streams and Rivers:

a. **Where physically practical and biologically desirable, the screen shall be constructed at the diversion entrance** with the screen face generally parallel to river flow. Physical factors that may preclude screen construction at the diversion entrance include excess river gradient, potential for damage by large debris, and potential for heavy sedimentation. For screens constructed at the bankline, the screen face shall be aligned with the adjacent bankline and the bankline shall be shaped to smoothly match the face of the screen structure to prevent eddies in front, upstream, and downstream of the screen. If trash racks are used, sufficient hydraulic gradient is required to route juvenile fish from between the trash rack and screens to safety.

b. **Where installation of fish screens at the diversion entrance is not desirable or impractical**, the screens may be installed in the canal downstream of the entrance at a suitable location. All screens installed downstream from the diversion entrance shall be provided with an effective bypass system approved by NMFS, designed to collect juvenile fish and safely transport them back to the river with minimum delay. The angle of the screen to flow should be adequate to effectively guide fish to the bypass (see Section F, Bypass Layout).

2. Lakes, Reservoirs and Tidal areas:

a. **Intakes shall be located offshore** where feasible to minimize fish contact with the facility. Water velocity from any direction toward the screen shall not exceed allowable approach velocities (see Section B, Approach Velocity). When possible, intakes shall be located in areas with sufficient sweeping velocity to minimize sediment accumulation in or around the screen and to facilitate debris removal and fish movement away from the screen face (see Section C, Sweeping Velocity).

b. If a **screened intake is used to route fish past a dam**, the intake shall be designed to withdraw water from the most appropriate elevation based on providing the best juvenile fish attraction and appropriate water temperature control downstream of the project. The entire range of forebay fluctuation shall be accommodated in design, unless otherwise approved by the NMFS.

B. Approach Velocity - Definition: Approach velocity is the water velocity component perpendicular to and approximately three inches in front of the screen face.

1. **Salmonid fry** [less than 2.36 inches {60.0 millimeters (mm)} in length]: The approach

velocity shall not exceed 0.40 feet per second (fps) {0.12 meters per second (mps)}.

2. **Salmonid fingerling** {2.36 inches (60.0 mm) and longer}: The approach velocity shall not exceed 0.80 fps (0.24 mps).

3. The **total submerged screen area required** (excluding area affected by structural components) is calculated by dividing the maximum diverted flow by the allowable approach velocity (also see Section K, Modified Criteria for Small Screens).

4. The screen design must provide for **uniform flow distribution** over the screen surface, thereby minimizing approach velocity. This may be accomplished by providing **adjustable porosity control** on the downstream side of screens, unless it can be shown unequivocally (such as with a physical hydraulic model study) that localized areas of high velocity can be avoided at all flows.

C. Sweeping Velocity - Definition: Sweeping velocity is the water velocity component parallel and adjacent to the screen face.

1. Sweeping velocity shall be **greater than the approach velocity**. This is accomplished by angling the screen face at less than 45° relative to flow (also see Section K, Modified Criteria for Small Screens). This angle may be dictated by site specific canal geometry, hydraulic, and sediment conditions.

D. Screen Face Material

1. **Fry criteria** - If biological justification can not be provided to demonstrate the absence of fry-sized salmonids {less than 2.36 inches (60.0 mm)} in the vicinity of the diversion intake leading to the screen, fry will be assumed present and the following criteria apply for screen material:

a. **Perforated plate:** Screen openings shall not exceed **3/32 or 0.0938 inches** (2.38 mm).

b. **Profile bar screen:** The narrowest dimension in the screen openings shall not exceed **0.0689 inches** (1.75 mm) in the narrow direction.

c. **Woven wire screen:** Screen openings shall not exceed **3/32 or 0.0938 inches** (2.38 mm) in the narrow direction (example: 6-14 mesh).

d. Screen material shall provide a minimum of **27% open area**.

2. **Fingerling criteria** - If biological justification can be provided to demonstrate the absence of fry-sized salmonids {less than 2.36 inches (60.0 mm)} in the vicinity of the diversion intake leading to the screen, the following criteria apply for screen material:

- a. **Perforated plate:** Screen openings shall not exceed **1/4 or 0.25 inches** (6.35 mm).
 - b. **Profile bar screen:** The narrowest dimension in the screen openings shall not exceed **1/4 or 0.25 inches** (6.35 mm) in the narrow direction.
 - c. **Woven wire screen:** Screen openings shall not exceed **1/4 or 0.25 inches** (6.35 mm) in the narrow direction.
 - d. Screen material shall provide a minimum of **40% open area**.
3. The screen material shall be **corrosion resistant** and sufficiently durable to maintain a smooth uniform surface with long term use.

E. Civil Works and Structural Features

1. The face of all **screen surfaces shall be placed flush** (to the extent possible) with any adjacent screen bay, pier noses, and walls to allow fish unimpeded movement parallel to the screen face and ready access to bypass routes.
2. Structural features shall be provided to **protect the integrity of the fish screens** from large debris. Provision of a **trash rack, log boom, sediment sluice**, and other measures may be needed. A reliable, ongoing **preventative maintenance and repair program** is necessary to assure facilities are kept free of debris and that screen mesh, seals, drive units, and other components are functioning correctly.
3. Screen surfaces shall be constructed at an angle to the approaching flow, with the downstream end of the **screen terminating at the entrance to the bypass system**.
4. The civil works shall be designed in a manner that **eliminates undesirable hydraulic effects** (such as eddies and stagnant flow zones) that may delay or injure fish or provide predator habitat or predator access. **Upstream training wall(s)**, or some acceptable variation thereof, shall be utilized to control hydraulic conditions and define the angle of flow to the screen face. Large facilities **may require hydraulic modeling** to identify and correct areas of concern.

F. Bypass Layout

1. The **screen and bypass shall work in tandem** to move out-migrating salmonids (including adults) to the bypass outfall with a minimum of injury or delay. The bypass entrance shall be located so that it can easily be located by out-migrants. Screens placed in diversions shall be constructed with the downstream end of the **screen terminating at a bypass entrance**. **Multiple bypass entrances** (intermediate bypasses) shall be employed if the sweeping velocity will not move fish to the bypass within 60 seconds, assuming fish are transported at this velocity.

2. The bypass entrance and all components of the bypass system shall be of **sufficient size and hydraulic capacity to minimize the potential for debris blockage**.
3. In order to improve bypass collection efficiency for a single bank of vertically-oriented screens, a **bypass training wall** shall be located at an angle to the screens, with the bypass entrance at the apex and downstream-most point. This will aid fish movement into the bypass by creating hydraulic conditions that conform to observed fish behavior. For single or multiple vee screen configurations, training walls are not required, unless a intermediate bypass is used (see Section F, Bypass Layout, Part 1).
4. In cases where there is insufficient flow available to satisfy hydraulic requirements at the bypass entrance (entrances) for the main screens, a **secondary screen** may be required. This is a screen located in the main screen bypass which allows the prescribed bypass flow to be used to effectively attract fish into the bypass entrance(s) and then allow for all but a reduced residual bypass flow to be routed back (by pump or gravity) for the primary diversion use. The residual bypass flow (not passing through the secondary screen) would then convey fish to the bypass outfall location or other destination.
5. **Access is required** at locations in the bypass system where debris accumulations may occur.
6. The **screen civil works floor** shall be designed to allow fish to be routed back to the river safely, if the canal is dewatered. This may entail a sumped drain with a small gate and drain pipe, or similar provisions.

G. Bypass Entrance

1. Each bypass entrance shall be provided with **independent flow-control capability**, acceptable to NMFS.
2. The **minimum bypass entrance flow velocity** must be greater than or equal to the maximum flow velocity vector resultant upstream of the screens. A gradual and efficient acceleration of flow into the bypass entrance is required to minimize delay by out-migrants.
3. **Ambient lighting conditions** are required at, and inside of, the bypass entrance and should extend downstream to the bypass flow control.
4. The **bypass entrance** must extend from the floor to the canal water surface.

H. Bypass Conduit Design

1. Bypass pipes shall have **smooth surfaces** and be designed to provide conditions that minimize turbulence. Bypass conduits shall have a **smooth joint design** to minimize turbulence and the potential for fish injury and shall be satisfactory to the NMFS.
2. Fish shall **not be pumped** within the bypass system.
3. Fish shall **not be allowed to free-fall within a confined shaft** in a bypass system.
4. **Pressures in the bypass pipe** shall be equal to or above atmospheric pressures.
5. **Bends shall be avoided** in the layout of bypass pipes due to the potential for debris clogging. **Bypass pipe center-line radius of curvature (R/D)** shall be greater than or equal to 5. Greater R/D may be required for super-critical velocities.
6. Bypass pipes or open channels shall be designed to **minimize debris clogging and sediment deposition** and to facilitate cleaning as necessary. Therefore, the required pipe diameter shall be greater than or equal to 24 inches {0.610 meters (m)}, and pipe velocity shall be greater than 2.0 fps (0.610 mps), unless otherwise approved by the NMFS, for the entire operational range (also see Section K, Modified Criteria for Small Screens, Part 4).
7. **Closure valves** of any type are not allowed within the bypass pipe, unless approved by NMFS.
8. The **minimum depth** of open-channel flow in a bypass conduit shall be greater than or equal to 0.75 feet (0.23 m), unless otherwise approved by the NMFS (also see Section K, Modified Criteria for Small Screens, Part 5).
9. **Sampling facilities** installed in the bypass conduit shall not impair normal operation of the facility.
10. The bypass pipe hydraulics should not produce a **hydraulic jump** within the pipe.

I. Bypass Outfall

1. Bypass outfalls should be located such that **ambient river velocities** are greater than 4.0 fps (1.2 mps).
2. Bypass outfalls shall be **located to minimize avian and aquatic predation** in areas free of eddies, reverse flow, or known predator habitat.
3. Bypass outfalls shall be **located where the receiving water is of sufficient depth** (depending on the impact velocity and quantity of bypass flow) to ensure that fish injuries are avoided at all

river and bypass flows.

4. Maximum bypass outfall **impact velocity** (including vertical and horizontal velocity components) shall be less than 25.0 fps (7.6 mps).
5. The bypass outfall discharge into tailrace shall be designed to **avoid adult attraction or jumping injuries**.

J. Operations and Maintenance

1. Fish screens shall be **automatically cleaned** as frequently as necessary to prevent accumulation of debris. The cleaning system and protocol must be effective, reliable, and satisfactory to the NMFS. Proven cleaning technologies are preferred.
2. Open channel intakes shall include a trash rack in the screen facility design which shall be kept free of debris. In certain cases, a satisfactory profile bar screen design can substitute for a trash rack.
3. The head differential to trigger screen cleaning for intermittent type cleaning systems shall be a maximum of 0.1 feet (0.03 m) or as agreed to by the NMFS.
4. The completed screen and bypass facility shall be made available for inspection by NMFS, to verify compliance with the design and operational criteria.
5. Screen and bypass facilities shall be evaluated for biological effectiveness and to verify that hydraulic design objectives are achieved.

K. Modified Criteria for Small Screens (Diversion flow less than 25 cfs)

The following criteria vary from the criteria listed above and apply to smaller screens. Twenty-five cfs is an approximate cutoff; however, some smaller diversions may be required to apply more universal criteria listed above, while some larger diversions may be allowed to use the "small screen" criteria listed below. This will depend on site constraints.

1. The **screen area required** is shown in Section B, Approach Velocity, Parts 1, 2 and 3. Note that "maximum" applies to the greatest flow diverted, not necessarily the water right.

2. Screen orientation:

- a. For **screen lengths less than or equal to 4 feet**, screen orientation may be angled or perpendicular relative to flow.
- b. For **screen lengths greater than 4 feet**, screen-to-flow angles must be **less than or**

equal to 45 degrees (see Section C, Sweeping Velocity, Part 1).

c. For drum screens, the **design submergence shall be 75%** of drum diameter. Submergence shall not exceed 85%, nor be less than 65% of drum diameter.

3. The **minimum bypass pipe diameter shall be 10 inches**, unless otherwise approved by NMFS.

4. The **minimum allowable pipe depth is 0.15 feet** (1.8 inches or 4.6 cm) and is controlled by designing the pipe gradient for minimum bypass flow.

Questions concerning this document can be directed to NMFS Environmental and Technical Services Division Engineering staff, at 503-230-5400.

Adopted,

(original on file)

William Stelle, Jr. Date 3-23-95
Regional Director

ADDENDUM
JUVENILE FISH SCREEN CRITERIA FOR PUMP INTAKES

Developed by
National Marine Fisheries Service
Environmental & Technical Services Division
Portland, Oregon
May 9, 1996

The following criteria serve as an addendum to current National Marine Fisheries Service gravity intake juvenile fish screen criteria. These criteria apply to new pump intake screens and existing inadequate pump intake screens, as determined by fisheries agencies with project jurisdiction.

Definitions used in pump intake screen criteria

Pump intake screens are defined as screening devices attached directly to a pressurized diversion intake pipe. **Effective screen area** is calculated by subtracting screen area occluded by structural members from the total screen area. **Screen mesh opening** is the narrowest opening in screen mesh. **Approach velocity** is the calculated velocity component perpendicular to the screen face. **Sweeping velocity** is the flow velocity component parallel to the screen face with the pump turned off.

Active pump intake screens are equipped with a cleaning system with proven cleaning capability, and are cleaned as frequently as necessary to keep the screens clean. **Passive** pump intake screens have no cleaning system and should only be used when the debris load is expected to be low, and

- 1) if a small screen (less than 1 CFS pump) is over-sized to eliminate debris impingement, and
- 2) where sufficient sweeping velocity exists to eliminate debris build-up on the screen surface, and
- 3) if the maximum diverted flow is less than .01% of the total minimum streamflow, or
- 4) the intake is deep in a reservoir, away from the shoreline.

Pump Intake Screen Flow Criteria

The **minimum effective screen area** in square feet for an **active** pump intake screen is calculated by dividing the maximum flow rate in cubic feet per second (CFS) by an approach velocity of **0.4 feet per second (FPS)**. The **minimum effective screen area** in square feet for a **passive** pump intake screen is calculated by dividing the maximum flow rate in CFS by an approach velocity of **0.2 FPS**. Certain site conditions may allow for a waiver of the 0.2 FPS approach velocity criteria and allow a passive screen to be installed using 0.4 FPS as design criteria. These cases will be considered on a site-by-site basis by the fisheries agencies.

If fry-sized salmonids (i.e. less than 60 millimeter fork length) are not ever present at the site and larger juvenile salmonids are present (as determined by agency biologists), approach velocity

shall not exceed 0.8 FPS for active pump intake screens, or 0.4 FPS for passive pump intake screens. The allowable flow should be distributed to achieve uniform approach velocity (plus or minus 10%) over the entire screen area. Additional screen area or flow baffling may be required to account for designs with non-uniform approach velocity.

Pump Intake Screen Mesh Material

Screen mesh openings shall not exceed **3/32 inch** (2.38 mm) for woven wire or perforated plate screens, or 0.0689 inch (**1.75 mm**) for profile wire screens, with a minimum **27% open area**. If fry-sized salmonids are never present at the site (by determination of agency biologists) screen mesh openings shall not exceed **1/4 inch** (6.35 mm) for woven wire, perforated plate screens, or profile wire screens, with a minimum of **40% open area**.

Screen mesh material and support structure shall work in tandem to be sufficiently durable to withstand the rigors of the installation site. No gaps greater than 3/32 inch shall exist in any type screen mesh or at points of mesh attachment. Special mesh materials that inhibit aquatic growth may be required at some sites.

Pump Intake Screen Location

When possible, pump intake screens shall be placed in locations with **sufficient sweeping velocity** to sweep away debris removed from the screen face. Pump intake screens **shall be submerged** to a depth of at least one screen radius below the minimum water surface, with a minimum of one screen radius clearance between screen surfaces and adjacent natural or constructed features. A **clear escape route** should exist for fish that approach the intake volitionally or otherwise. For example, if a pump intake is located off of the river (such as in an intake lagoon), a conventional open channel screen should be considered, placed in the channel or at the edge of the river. Intakes in reservoirs should be as deep as practical, to reduce the numbers of juvenile salmonids that approach the intake. Adverse alterations to riverine habitat shall be minimized.

Pump Intake Screen Protection

Pump intake screens **shall be protected** from heavy debris, icing and other conditions that may compromise screen integrity. Protection can be provided by using log booms, trash racks or mechanisms for removing the intake from the river during adverse conditions. An **inspection and maintenance plan** for the pump intake screen is required, to ensure that the screen is operating as designed per these criteria.

ATTACHMENT 7

RIPARIAN ROAD GUIDE

INCLUDING:

ROAD SURFACE DRAINAGE SPACING



Cover Page

Riparian Road Guide: Managing Roads to Enhance Riparian Areas

This guide provides a step-by-step, cost-effective and practical approach to road building and repair that results in both clean water and safe roads. Includes photographs and charts that clearly explain new and emerging techniques. Written for local governments and road designers and contractors, this guide is also of interest to environmentalists and travelers.

1994, 32 pages, item #H10 - \$10.95

Criteria for Cross-Drain Spacings

Table 2. Cross-drain spacings required to prevent rill or gully erosion deeper than 1 inch on secondary logging roads built in the upper topographic position* of north-facing slopes having a gradient of 80%***.**

Road grade (percent)	Cross-drain spacing					
	Hard sediment	Basalt	Granitic	Glacial silt	Andesite	Loess
2	161	154	137	135	105	95
4	151	139	122	120	90	80
6	141	131	114	112	82	72
8	131	124	107	105	75	65
10	121	115	98	96	66	57
12	111	106	89	87	57	48
14	105	95	78	76	46	37

*** On middle topographic position, reduce spacings 18 feet on lower topographic position, reduce spacings 36 feet.**

**** On South aspects, reduce spacing 15 feet.**

***** For each 10 percent decrease in slope steepness below 80%, reduce spacing 5 feet.**

ATTACHMENT 8

BRIDGE RELOCATION

BURGDORF BRIDGE RELOCATION

PURPOSE AND NEED: The Burgdorf Bridge, crossing Lake Creek on FDR 50251, is currently the only access to Burgdorf Guard Station and Burgdorf Campground. It also accesses sheep loading and unloading facilities used by a permittee of the National Forest. The federal action included all activities associated with relocating the bridge, until they are completed.

This bridge, built in 1958, was determined in 1992 to be in disrepair. Most of the structure was showing signs of age, and rot was present in many of the components (as seen in the cores recovered during the last bridge inspection). Original plans in 1993 called for relocating the bridge about 128 feet downstream of its current location. Due to structural concerns and continuing deterioration, the existing superstructure, deck, and sills were replaced in 1998. These measures were intended to be temporary to keep access open until the bridge could be relocated and replaced. Continuing deterioration of the abutments, erosion of the adjacent streambank due to channel meandering, and availability of engineering funds have resulted in scheduling the full replacement of this bridge in 2001. Construction of the approach road is scheduled to begin after July 4. Construction of the new bridge is scheduled to begin after Labor Day due to fisheries concerns and to minimize conflicts with the public wishing to access Burgdorf campground.

LOCATION: The site is in the Secesh River subwatershed at T23N R4E Sec 1. Burgdorf Bridge crosses Lake Creek at this location. See map in Current CD:\support documents\roads\SFSR Burgdorf Bridge.pdf.

DESCRIPTION: The existing 55-foot long bridge will be replaced with an 80-foot long self-weathering steel superstructure on retaining wall abutments with timber fascia. The increased bridge span will leave more of the floodplain in an undisturbed state, decreasing flow constriction and allowing the channel additional room to meander naturally. The new bridge will provide a 100-year flow of 1554 ft²/second and an additional 2.4 feet of clearance for debris passage. It will also provide adequate stream bank clearance on either side so that no in-stream work will be required, and the natural shoreline can be restored and retained. (See plans in Current CD:\support documents\roads\SFSR Burgdorf Bridge.pdf).

The crossing location will be moved downstream about 128 feet. Relocation, as well as the increased length, will accomplish a number of objectives:

- The new location removes the bridge from the vicinity of an unstable, undercutting bend just upstream of the existing site and places it across a straight reach with less sinuosity and a lower gradient. The new site is an improvement over the old one because of the lower gradient, less sinuosity, larger channel substrate, and a lack of active erosion of streambanks (pers. comm., Jim Fitzgerald, McCall District hydrologist).
- Relocating the bridge to an area less likely to be affected by natural meandering will reduce sedimentation potential due to river/structure interactions and will allow reclamation and restoration of the old road location and stream site.

- Effects to the wetland area, upper reach and feeder stream adjacent to the existing site will be reduced.
- Potential road washout and stream sedimentation, which could occur associated with the undercutting bank just upstream of the existing site, will be reduced. The stream will be allowed to meander naturally in this area.
- The existing bridge would serve as the detour for the duration of the project, eliminating the need to ford the river by those wanting access to the guard station or campground.
- Removing the existing bridge will result in less use of an existing ford adjacent to it, resulting in less impact to a spawning area.
- Better road alignment will increase sight distance, reducing the chance of accidents and potential fuel spills.
- The wetland vegetation at the existing bridge approaches can be restored.

REQUIRED MITIGATION:

1. General

- All equipment refueling will occur outside of RHCAs (more than 300 feet from water). Fuel for equipment will be transported in US DOT approved containers of less than 100 gallons in size. No fuel will be stored within RHCAs, and all vehicles transporting fuel will be parked outside of RHCAs. The fuel storage area will be determined by the contracting officer's representative and a journey level fisheries biologist. This minimizes the likelihood of fuel entering the stream, potentially causing mortality to eggs, juveniles or to adults.
- Work at the construction site will occur during late fall, during low flow periods and after chinook spawning.
- A journey level fishery biologist will survey the stream near the construction site for redds prior to any construction or demolition. Any identified redds will be protected from disturbance.
- Fish found spawning near the project after the start of construction will be observed for effects (disturbance) by project activities. If activities are causing the fish to move away from redds, construction will be stopped until redds are completed, and the fish have left the area.
- No personnel, vehicles, or equipment will be allowed to ford or work within the stream at any time except as necessary for restoration work. This reduces the likelihood of harassment of spawners, the potential of accidental 'take' of eggs in a redd by trampling, and sediment delivery.
- Drafting of water for dust abatement and road compacting will be restricted to an area identified by a fishery biologist and/or hydrologist to reduce the potential for "take" of fish.
- Any draft suction hose used will be equipped with a screen of 3/32 inch mesh or less and will have an intake flow of less than 1 foot/second to reduce the potential for entraining juvenile fish.

2. Detour (Existing bridge)

- The existing bridge will act as a detour during the construction of the new bridge. It will be removed once the new bridge is ready for use. Removal will occur during low water periods.
- The remainder of the old roadbed will be removed and the roadbed recontoured to approximate the pre-project landscape.
- A Revegetation Plan is being prepared by a journey level hydrologist. The plan will outline measures to re-establish/restore the shoreline and wetland area. The plan will provide for stabilization for up to three years, to protect the bank and vegetation during high flows until vegetation is well established. This plan will include incorporating willow wads at the bankfull elevation, planting sedge plugs throughout the reclaimed wetland area, and hydro mulching and tackifying all remaining unvegetated areas. The hydrologist will determine the sources for willow and sedge plug removal, as well as their placement. Holes created from source removal will be filled using salvaged topsoil. Fencing may be needed to

protect the area from elk and sheep. The old road will be blockaded using large riprap.

- The old roadbed and approaches will be revegetated using measures described above.
- Best Management Practices (BMPs) using sediment mats, silt fences and/or straw bales, etc shall be included in the contract and will be in place prior to the final removal of the abutments and roadbed to control erosion.
- Removal of the abutments will require working within bankfull perimeters. This work will occur during low flow periods to avoid entry into the active waterway. Erosion control materials identified above (silt fence, straw bales, etc.) will be used to reduce potential sediment delivery.
- Riverbanks will be restored as much as possible once the old bridge is removed, with agreement from a journey level hydrologist and fisheries biologist.
- No in-stream work will occur, except for restoration of the channel near the old bridge location.
- A journey level hydrologist will remove erosion control structures when the site has revegetated.
- Waste/excess excavation material will be hauled off site.

3. New bridge site

- The length of the superstructure will enable the bridge to be constructed with no instream work. Natural banks will be maintained.
- Vegetation removed will be conserved for revegetation of the old road.
- BMPs using silt fences, straw bales and other measures will be included in the contract and applied prior to construction to minimize sediment delivery to the stream from the construction site and from possible severe thunderstorm events.
- The bridge will be paved with asphalt.

4. New road

- The vegetation removed will be conserved for the revegetation of the old road.
- The minimum number of trees necessary will be felled to accommodate the new road. Trees felled will be left on site, or used in rehabilitation at the old bridge site.
- The roadway will be paved for 75 feet on both sides of the bridge, and aggregate placed for approximately 500 feet beyond the pavement to reduce sediment delivery from the road.
- All disturbed areas outside of the new road surface will be planted with sedge plugs to reduce sediment movement during the appropriate time of the year.
- Approaches may incorporate geotextile to assist in roadbed stabilization.
- Ditch armor of large granite cobble will be placed on the approaches to reduce direct sediment delivery to the stream from the road.
- Permanent erosion control, such as seeding and application of mulch will be applied to all exposed, disturbed, unvegetated areas caused by this project including road slopes. This reduces cut and fill slope erosion, and reduces the likelihood of sediment delivery to the stream.

Relocating the bridge to an area less likely to be affected by natural meandering will reduce sedimentation potential due to river/structure interactions and will allow reclamation and restoration of the old road location and stream site. The wetland vegetation at this site can be restored. Effects to the wetland area, upper reach and feeder stream adjacent to the existing site will be reduced by removing human impacts in this area. Potential road washout and stream sedimentation, which could occur associated with the undercutting bank just upstream of the existing site, will be reduced. The stream will be allowed to meander naturally in this area. Removing the existing bridge will result in less use of an existing ford adjacent to it, resulting in less impact to a spawning area. Better road alignment will increase sight distance, reducing the chance of accidents and potential fuel spills

The new bridge replaces the decayed existing structure, maintains the current use of the road in a safer manner, removes the risk of collapse of the existing bridge, and removes the potential for a fuel spill. Revegetating and restoring the disturbed area near the existing bridge will improve riparian conditions. The proposed project is not expected to affect the following PACFISH RMO's: 1) pool frequency, 2) water temperature, 3) large woody debris, and 4) width: depth ratio.

The risk of sediment delivery from the proposed project is reduced through project design and mitigation measures added to address erosion control. The project is not expected to negatively affect habitat indicators relating to sediment (e.g., pool depths, number of pools, width: depth ratios)

Trees felled for new road alignment will be left as potential sources of future wood recruitment, or used to restore the old bridge site.

In the short term, the project design, including BMPs and other mitigation will reduce potential sediment production and will begin restoration of vegetation at the old crossing location. In the long term, benefits will be realized from restoring conditions at the old crossing site, and providing access in an area less likely to experience erosion and subsequent sediment delivery from bridge structure/stream interactions.

Activities will be scheduled at times to avoid spawning fish. Chinook salmon spawning peaks in mid to late August with some redds found in September. In 1998, 23 (out of 39) redds were counted between the present bridge location upstream to Threemile Creek. Eleven redds were counted downstream of the bridge (J. Hansen, Nez Perce tribal fishery biologist, pers. comm.).

Sediment delivery, especially to Lake Creek would be minimized by use of BMP's including straw bales, silt fences, and the prohibition of fording. In the long term, road prism erosion and delivery potential will decrease due to the relocation of the bridge to a more stable reach. The new bridge will meet the PACFISH 100 year flood design. This will allow passage of additional spring flows and will reduce the eddy effect and potential stream bank scour on the downstream side, as well as scour from the existing narrow

abutments. The replacement of the existing bridge reduces the probability of a bridge failure and subsequent effects on listed fish. Harassment of adult or juvenile fish is not expected because fording of equipment and personnel wading will be prohibited.

ATTACHMENT 9

CULVERT REPLACEMENT

GOAT CREEK CULVERT REPLACEMENT

The Goat Creek crossing currently has a large culvert that is perched above the SFSR under typical flow conditions and acts as a migration barrier to the listed species. All listed species are present in some life stage in the SFSR near Goat Creek (Krassel District files). The existing culvert acts as a small dam and causes sediment to accumulate on its upstream end. Detailed descriptions, plans, and maps for the Goat Creek culvert replacement are at the end of this document and in Current CD:\support documents\roads\SFSR Goat Cr Bridge.

REQUIRED MITIGATION

All mitigation is incorporated as part of the federal action. For the Goat Creek culvert replacement, this includes the following items. Many project design features, BMPs, and erosion control measures will be similar to those used during the Fourmile culvert replacement (Appendix 4 of Faurot & Burns 1999). These items will be captured through the project plans, project design, and contract package. If monitoring of activities associated with this project should identify unanticipated effects to fish or fish habitat, the activity will be suspended by the District Ranger until corrections are made.

- Prior to construction, Goat Creek will be diverted well above the project area because of concerns regarding the volume of seepage in the construction area and ability to adequately dewater the site and maintain stable conditions during excavation.
- The creek will be conveyed around the construction area via a rigid pipe or some other means capable of containing both the flow anticipated during the operating season and higher flows in the event of a storm.
- Silt fences, straw bales, and other erosion control materials will be in place prior to the start of any ground disturbance (excavation).
- Fill areas will be covered with a geotextile to protect vegetation in areas along the creek to be covered with fill (if any are necessary).
- Sediment retaining materials will be placed at the end of the new channel immediately upstream of the confluence with the SFSR to reduce delivery of sediment to the river.
- Excavation will begin on the upstream (Goat Creek) side of the fill, after the installation of erosion control materials.
- Excavation at the confluence with the SFSR will occur after installation erosion control materials.
- Sediment collected by straw bales, etc. will be removed from the channel to the extent possible without causing resource damage, as determined by a journey-level fishery biologist or hydrologist.

- A settling basin will be constructed, or portable one used, that is able to handle the volume of water anticipated, and that provides filtering capability. Dewatering of the excavation site (of ground water from the excavation) will be done by pumping water to the settling basin and the basin cleaned out when full of sediments. Sediment will be transferred to one of two waste sites (see next item).
- Waste and excavated material will be hauled to the lower landing on the 474E road, about 1 mile south of the project site, or to the Reed Ranch borrow site, about 12 miles north of the project site.
- All fill will be removed back to the natural vegetation (where protected).
- The new channel and flood-prone area will be constructed and tied into Goat Creek at a location identified by a journey level hydrologist or soil scientist.
- The new channel will be built to the general depth, width, and sinuosity specifications for an A-type channel (Rosgen 1994). Specifications are identified in *Goat Creek Channel Dimensions* document by Tom Crawford (Appendix 3). The new channel will be excavated and washed to remove any excess fine material prior to introducing flow.
- All large wood encountered during excavation will be retained and incorporated into the new channel, unless a journey-level fishery biologist or hydrologist directs otherwise.
- Once Goat Creek is diverted into the new channel, a stable bank and channel at the point of diversion will be constructed. The bank will be constructed adequate to withstand high stream energy associated with a bend in the channel that will result at the diversion point. The channel will have adequate dimensions and profile (including gradient control structures, log/rock vein, etc.). The original Goat Creek channel will be plugged to ensure this stream is not recaptured during high flows.
- Because of the large volume of material to be excavated on the river side of the fill (between the outlet/wing walls and the SFSR), a high level of mitigation will be needed to reduce sediment delivery because of the close proximity to the river. Excavation is anticipated to be completed from underneath, because of the tunnel, but if this changes, a journey level hydrologist/soil scientist and the engineering staff will jointly develop an erosion/sediment control plan to be incorporated into the final contract package.
- All disturbed areas will receive mulch and seeding during the appropriate time of year for successful results, including the waste repositories.
- Erosion control materials will be removed by a journey level hydrologist or soil scientist when sites have revegetated.

- Journey level hydrologists/soil scientists will provide on-site implementation and effectiveness monitoring during project implementation.
- To the extent feasible, use any excavated plants in the stabilization of the new channel and banks. Stockpile such material in a cool, shaded site and keep moist. Retain as much of the root mass as possible during excavation and transport. If possible, locate an additional source of plant material and root wads to supplement vegetation needs not available on site.
- The new road surface at the crossing will be paved to a width of 14 feet (3 inches deep), with a $\frac{3}{4}$ inch aggregate base 18 feet wide (8 inches deep).
- The contract package for the Goat Creek culvert replacement will be reviewed by a journey level fishery biologist or hydrologist or soil scientist prior to it being awarded to ensure all mitigation items that are not being implemented by Forest force account crews are included in the contract package.

Sediment that has accumulated at the culvert will be removed during culvert replacement. Replacement of the culvert with an arch bridge will restore access to Goat Creek spawning and rearing habitat by eliminating the present barrier (NMFS 1993). In addition, the crossing area will be increased, and the hydraulic capacity increased from 1000 to 4000 cfs (Draft project plans, Charlie Showers, Appendix 3).

A review of the draft project plans noted several concerns and recommendations (D.Gordon, watershed specialist, Goat Creek Culvert Replacement comments below). These related to stream and groundwater management during construction, activities near the SFSR that may deliver sediment, and plant sources for revegetation of disturbed areas. These are addressed in the federal action description for the project in this BA, in the mitigation section.

During project implementation, sediment could be delivered to the SFSR. Use of effective, extensive BMPs (Appendix 4 of Faurot & Burns 1999), pre-approved by a journey level hydrologist or fish biologist, will minimize the amount of sediment mobilized during activities and avoid effects to listed fish and critical habitat. Mitigation measures developed in previous consultations with NMFS avoided short-term sediment loading associated with other sediment-disturbing activities on the SFSR Road (NMFS 1993). These measures have been proven in other studies to reduce sedimentation (Burroughs and King 1989, Megahan et al. 1992, and Swift 1986), and will help avoid potential sediment delivery to stream channels.

Replacement of the culvert with an arch bridge will restore natural sediment transport in the Goat Creek system, eliminating the current sediment accumulation. Removal of road fill at the culvert would also reduce the existing mass failure risk (Burns 1992). Restoration of fish passage to Goat Creek, removing road fill and accumulated sediment

in the culvert area, and restoration of natural sediment transportation patterns are provisions in the overall SFSR Road Reconstruction Project (Burns 1992).

In general, culvert removal, even with associated risk of short-term downstream sediment mobilization, is the best remedy for restoring fish passage (Reeves et al. 1991). Removal of culverts at Cabin Creek on the SFSR was completed in 1993 as part of the original SFSR Road Reconstruction Project. Fifty to seventy-five chinook salmon were observed migrating upstream in the mouth of Cabin Creek during August 1998 (N. Hershenow, hydrological technician, Payette NF, pers. comm.). Some of the fish continued upstream to spawn in Cabin Creek. Similar results are anticipated at Goat Creek.

Sediment reduction and very little sediment movement have been associated with other culvert removal activities and associated excavation and removal of fill material at Cabin Creek on the SFSR Road (USFS 1992-1998, Appendix 4 of Faurot & Burns 1999). Site visits during the Fourmile culvert replacement found sediment –control mitigation items in place and project activities being carried out as planned. To date the new channel is functioning as expected, however the new arch has not gone through a high flow period, so its performance under such conditions hasn't been evaluated (D. Gordon, soil scientist, Krassel Ranger District, pers. comm.).

Attachment 10

Potential Capture of Salmonid Fishes from Small Lakes and Ponds by Helicopter Bucket Dipping Associated with Fire Management Activities

MANAGEMENT BRIEF

Potential Capture of Salmonid Fishes from Small Lakes and Ponds by Helicopter Bucket Dipping Associated with Fire Management Activities

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Introduction

The potential for fire management activities to impact threatened and endangered fishes is of increasing concern to natural resource managers. Fire management tactics may have a direct impact on threatened and endangered fish species that is of greater concern than the ecological impacts of the fire itself. Fire management activities are implemented over a broad range of habitats where these species may be distributed.

Fire management activities such as dipping water from lakes and ponds using a helicopter with an attached bucket occurs every fire season throughout North America. Helicopter bucket dipping and dropping of water from rivers, streams, lakes and ponds is an effective fire management tool. However, dipping water from lakes and ponds with a helicopter bucket may result in individual fish being entrained within the bucket.

State and federal agencies implementing fire suppression activities are required to meet the intent of the Endangered Species Act, and to consult with appropriate regulatory agencies (US Fish and Wildlife Service and National Marine Fisheries Service) to assess the potential impacts of fire management activities on threatened, endangered, or sensitive species. This prompted the Boise National Forest to attempt to investigate whether helicopter bucket dipping from small, high elevation lakes and ponds results in capture and removal of at-risk fishes.

Study Area

The project area is located on the Boise National Forest, Payette River Basin, Idaho in the Warm Spring Creek Watershed, a tributary to the South Fork of the Payette River. Three high elevation (~2133m) mountain lakes typical of those used by bull trout (*Salvelinus confluentus*) and cutthroat trout (*Oncorhynchus clarki*), were selected for this evaluation. Bull Trout Lake is approximately 40 ha in size, Martin Lake is approximately 4 ha, and one unnamed “pothole” lake surveyed is approximately 0.2 ha in size. There are no inflow or outflow tributaries to Martin Lake or the “pothole” lake. The inflow tributary to Bull Trout Lake is Spring Creek, a salmonid spawning stream and the outflow is Warm Spring Creek.

Recent creel surveys identify primarily brook trout (*S. fontinalis*) inhabiting Bull Trout Lake, stocked rainbow trout (*O. mykiss*) inhabiting Martin Lake and the “pothole” lake

(Allen 1999). Hatchery rainbow trout, which were 20 to 30 cm in size, were stocked from July through August with approximately 4,000 in Bull Trout Lake, approximately 2,600 in Martin Lake and over 500 in the “pothole” lake (Alsager, 1999). All age classes of fish were found in Bull Trout Lake and only stocked hatchery trout 20 to 30 cm were found in Martin and the “pothole” lake. These lakes contain no threatened or endangered fish species, and were purposefully selected to avoid a “taking” under the Endangered Species Act.

Methods

The test was implemented on September 21, 1999, from 1000 to 1500 hours. Boise National Forest Service personnel included the Forest and District Fisheries Biologists, Forest Fuels Planner, and members of the Lucky Peak Helitac Crew. The crew installed a 5625 L fold-a-tank storage facility located near the inlet to Bull Trout Lake.

Prior to conducting the helicopter dipping tests a snorkel survey was completed to identify fish presence, distribution and species composition and abundance.

The helicopter used to conduct the dip test was a type two helicopter (Bell 212) and carried a 1230 L bucket extended from a “long line”, 30 m in length. We also tested the use of a short line, 4.6 m in length. A 1.2 m by 1.2 m bucket was attached and used to draw water from the surface of the waterbody. The bucket is weighted on one side to allow dragging and capturing of water. The water was then released from the bottom of the bucket into a 5625 L storage tank. Helicopter lift necessitated obtaining just 984 L of water at 2133 m elevation; therefore the bucket size was decreased to this capacity.

Water was dipped three times from within 30 m of the inlet and three times from within 9 m of the inlet on Bull Trout Lake. Three dips were taken near the lake center, and three near the outlet. In Martin Lake three dips were made at various locations, including center and off shore. Three additional dips were taken from the “pothole” lake, which contained approximately 200 hatchery rainbow trout. The final dip occurred near the inlet of Bull Trout Lake to demonstrate the use of the short line or belly bucket and associated rotor wash (see Figure 1).

Results

Snorkel surveys identified fish near the inlet to Bull Trout Lake feeding throughout the water column. Species identification and counts were difficult because the fish were wary of the snorkeler. Numerous brook trout juveniles and fry were observed in the inlet channels just upstream of their entrance to the lake. Two recreational fishermen caught rainbow trout near the inlet from 1130 to 1230 hours, just prior to the dipping test. Visual observations at Martin Lake identified little surface feeding. Species identification and counts were difficult because fish fled from the snorkeler and used aquatic plants for cover. We also snorkeled the “small pothole” lake located northeast of Bull Trout Lake, which contained approximately 200 hatchery rainbow trout. These fish ranged in size from 20 to 30 cm long. The maximum depth of the pond was

approximately one meter; average depth was approximately 0.4 m. Fish could easily be seen from the shore.

No fish were captured in any of the tests. Midge were found in mud and algae from the helicopter bucket dipping near the outlet of Bull Trout Lake. Flatworms were captured at Martin Lake.

Minimal rotor wash was observed with the use of the long line. Significant rotor wash was observed with the use of the short line or belly bucket (see Figure 1).

Discussion

During fire suppression water is dipped by helicopters from lakes, rivers, and streams that are within five minutes flying time from the fire. A suitable dip site is located according to specific criteria, which include safety considerations for the helicopter, water depth, and water surface area. Pilots typically dip at least 45 m from shore and utilize the deepest part of the water body to obtain water, but may dip from shallower areas if safe. In this test we attempted to sample typical helicopter dipping sites, as well as areas where fish were seen or expected to be in higher densities.

Fish appeared to avoid helicopter bucket dipping activity. The helicopter pilot reported seeing fish from the air in the “pothole” lake that he tried to capture. As the bucket approached the water surface, fish dispersed away from it. The fish dispersal appeared to be related to the shadow of the helicopter and dropping of the bucket since the long line was used and there was minimal rotor wash. In the last dip of the “pothole” lake, the pilot tried three times to capture fish by dragging the bucket toward a corner of the lake and was not successful.

The study sites primarily contained brook trout and hatchery rainbow trout, which were used as a surrogate for threatened, endangered, or sensitive salmonids in determining the potential for these species to be captured in these lakes by helicopter bucket dipping. Threatened and endangered fish are not found within the lakes sampled and the experiment assumed that non-listed salmonids would be at least as vulnerable to capture as listed species. It is not likely that wild native fish, such as bull trout, chinook salmon (*O. tshawytscha*), and steelhead trout would have lower avoidance behavior.

Conclusions

Fish appear to avoid helicopter bucket dipping activity from short line most likely due to rotor wash and from the long line most likely due to the shadow of helicopter hovering overhead dropping a bucket.

Our experiment was limited by sample size, location and fish species but we can reasonably conclude that there is a minimal potential of capture of salmonid fishes in lakes, reservoirs and ponds by helicopter bucket dipping. The results of this experiment identify that no fish were captured and visual observations identified fish avoidance and

dispersing behaviors. This experiment was performed in small high elevation lakes and ponds, however fish avoidance behaviors are likely similar in streams and rivers. Based on the results of this experiment, fish dispersal behavior and the lack of fish captured, it appears that there is a low likelihood that fish would be entrained in helicopter buckets dipped from rivers and streams. However, flow conditions in rivers and streams could affect potential drift of fish into buckets or the ability for fish to disperse. Therefore, extrapolation of the results to rivers and streams is not recommended and further experiments are necessary for rivers and streams.

References

Allen, D.B. 1999. Bull Trout Lake Area Creel Surveys. Idaho Department of Fish and Game. Nampa, Idaho.

Alsager, R.D. 1999. Personal Communication. Idaho Department of Fish and Game. Nampa, Idaho.

Figure 1. Helicopter bucket dipping with short line and dip tank. Rotor wash from helicopter is evident with the use of the short line.



Johnson Fire, Fishlake N.F. September 2002

Or
What Does
Aquatic Nuisance Species
Have To Do
With Fire Suppression
Activities?

Johnson Fire - summary

- ⇒ Approximately 1844 acres in size
- ⇒ Suppression cost approx 2 million dollars
 - 30-50 loads of fire retardant used
 - 3-4 helicopters
 - Several light helicopters
 - Bucket work
 - Skycrane with 2,500 tank
 - Suction tube - can fill tank in less than a minute
- ⇒ Fuel driven fire (note photos)?

Johnson Fire - Seven Mile Drainage



Johnson Fire - UM Creek Drainage



Johnson Fire – 2002



- ⇒ Cattle grazing burned Water Flat meadow regrowth 3 weeks post-fire.

Johnson Fire – Whirling Disease Concerns from Initial Suppression Actions

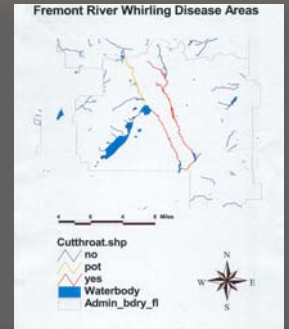
- ⇒ Helicopter bucket dipping from both UM Creek (positive) and Seven mile Creek (negative)
- ⇒ Helicopter drafting hose – pulls up mud
 - Water drops reported to be black
- ⇒ Long distance movement of water
 - Between watersheds and within watersheds
- ⇒ Drafting by fire engines

Johnson Fire – Whirling Control Actions Undertaken During the Fire

- ⇒ Drafting from only one creek at a time per helicopter or engine
- ⇒ Disinfecting equipment and water
- ⇒ Cleaning and disinfecting equipment (including helicopter tanks) when leaving fire

Fishlake N.F. Actions to be Undertaken Over Winter

- ⇒ Cutthroat map
- ⇒ Whirling map
- ⇒ Education of fire and other Forest personnel
- ⇒ Keep P-code open to test for Whirling Disease in 7-mile Creek (3 yrs)
- ⇒ Elevate concern to higher levels
 - Hayman Fire Colorado had similar concerns



Summary –

- ⇒ Fire Suppression Efforts can be a potential means to transport Aquatic Nuisance Species and Disease
 - Whirling Disease
 - Mussels
 - Plants
 - Other non-native organisms
- ⇒ Coordination of Aquatic and Fire Personnel is Needed
- ⇒ Education of Means to Prevent Spread of ANS Needed
 - Common Sense

ATTACHMENT 11

ROAD DITCH MAINTENANCE AND TRAFFIC EFFECTS

EFFECTS OF TRAFFIC AND DITCH MAINTENANCE ON FOREST ROAD SEDIMENT PRODUCTION

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Abstract: Observations of sediment yield from road segments in the Oregon Coast Range show that either heavy traffic during rainfall or blading the road ditch will increase erosion from forest roads. For the fine soils and high quality aggregate surfacing on the study plots, ditch blading increased sediment yield more than traffic equivalent to 12 log trucks per day. The combination of ditch blading and heavy traffic did not produce significantly more sediment than simply blading the ditch, a finding with important implications for sediment modeling and erosion control design. Increases in sediment production caused by traffic persisted after traffic ceased.

INTRODUCTION

Road maintenance and traffic are two of the primary activities affecting sediment production from forest roads. Given the large base of existing roads in forestlands, it is important that we understand how these activities affect sediment yield from road systems. While it is generally agreed that either traffic or ditch maintenance increase sediment production, observations showing the combined effects relative to individual effects are lacking.

Maintenance keeps roads in a condition suitable for travel and prevents severe erosion from failure of the drainage system. Unfortunately, road grading can break up armor layers on the road surface or the ditch and temporarily increase road surface erosion (Burroughs and King, 1989; Black and Luce, 1999; Luce and Black, 1999). Burroughs and King (1989) noted increased erodibility of the traveledway following road grading operations. However, Luce and Black (1999) noted that blading of only the traveledway on an aggregate surfaced road with well vegetated ditches yielded no increase in sediment production from a complete road segment, while blading of the ditch, cutslope, and traveledway substantially increased sediment yield from road segments. The recovery from ditch blading occurs rapidly during the first three years (Luce and Black, 2001) in an exponential pattern similar to that found by Megahan (1974) for new roads. Observations of vegetation and ditch particle size suggest that much of the reduction over time is due to armoring rather than revegetation (Black and Luce, 1999).

The role of traffic in increasing road sediment production is likewise well recognized and has had attention from several researchers (Reid and Dunne, 1984; Swift, 1984; Bilby et al., 1989; Burroughs and King, 1989; Coker et al., 1993; Foltz, 1999; Ziegler et al., 2001), who report a range from doubled sediment production to 30 times as much. Results are commonly reported as ratios between yields from roads with and without traffic, conceptually normalizing for precipitation and allowing generalization of the results beyond the particular events studied. Many of the studies are from rainfall simulation; some experiments were on the entire road prism, and some isolated sediment from the traveledway. Those studies where concentration samples were taken show a relatively brief effect from traffic passing during a storm, with significant recovery occurring on a time scale of tens of minutes. The postulated processes for

the increase in sediment yield are through an increased availability of fines caused by crushing the road surfacing and by pressing larger particles down through a matrix of finer sediment.

An important question left unanswered by these studies is the combined effect of ditch maintenance and traffic. One hypothesis is that the effects are cumulative. Some models use the ratios from the studies to estimate the effect, one factor is applied for the time since construction or disturbance of the ditch and another is applied for the traffic level (e.g. Cline et al., 1984; and Washington Forest Practices Board, 1995). Another way to model the effect is through addition, where the traveledway and ditch contributions are calculated separately based on their individual treatments and then added. A third alternative would suggest that there might be tradeoffs, that the total effect may be less than the sum of the parts. Increasing the availability of sediment in the ditch and on the traveledway may be somewhat redundant. If the sediment transport capacity of the ditch is fully sated by material easily detached in the ditch, the additional available fine material on the traveledway may have little effect on the segment sediment yield.

Consideration of the flowpath is important in estimating the effects of treatments to roads. Burroughs and King (1989) showed an effect on traveledway sediment yield from blading, but Luce and Black (1999) found nearly no effect on sediment yield from an entire road segment given the same treatment. One explanation may be that sediment from the road surface was trapped in the well vegetated ditch, implying that grading the ditch would not only allow ditch erosion, but also allow passage of the traveledway sediment. This logic would support the idea that there is a positive non-linear interaction (e.g. multiplicative) between road surface treatments and ditch treatments on sediment yield. Alternatively, Burroughs and King (1989) noted that substantial reductions in traveledway sediment production by placing rock aggregate (~80%) did not reduce total plot sediment production as much (~30%) because of increased sediment detachment in the unprotected ditch. This observation suggests that high sediment yields can come from either unprotected ditches or unprotected (or heavily traveled) traveledways, supporting the tradeoff hypothesis. Another observation is that traffic forms ruts, causing sediment produced on the road surface to travel on the road surface independently of ditch sediments, supporting a simple additive model. Some would be quick to point out, however, that this also robs the ditch of much of its water as well, and if the road surface is constructed with material that is less erodible than the ditch, traffic could conceivably reduce sediment yields on roads with freshly cleaned ditches.

Because the earlier studies on the individual effects of traffic and maintenance are used as the basis of sediment yield models, forest practice regulations, and best management practice design, it is important that some of the uncertainty associated with the question of combined effects be reduced. Unfortunately, the question cannot be answered with physically based models, because any of the three hypotheses can be generated using different choices of parameter values and flowpath. Observations showing the individual and combined effects of traffic and maintenance are needed to understand the interaction.

METHODS

The effects of traffic and ditch maintenance were examined on twelve road segments in the Oregon Coast range about 20 km northwest of Eugene, Oregon. The twelve plots were broken

into four categories, those with no traffic and no ditch grading (NTNG), those with traffic and no ditch grading (TNG), those with no traffic but with a graded ditch (NTG) and those with both traffic and a graded ditch (TG). Traffic was applied to one contiguous set of six road segments for practical reasons, and the grading treatment was assigned randomly.

The road segments all had similar characteristics otherwise. All had lengths of 80 m and were isolated by ditch dams and rubber-flap/wood-box water bars and runoff was diverted into sediment traps. Road gradient was between 9 and 10 percent, and cutslope heights were approximately 2 m on all road segments. The roads were constructed on a silty clay loam soil over weathered sandstone. The roads were surfaced with high quality basalt aggregate and had inboard ditches. The traveledway was freshly bladed on all plots. All ditches and cutslopes were seeded with grass during the previous spring, and the ditches were bladed on October 14, 1999 for the segments with that treatment. The reader is referred to Luce and Black (1999) for more details on plot construction and soil attributes.

Traffic was provided by a short log truck and, later, a dump truck. Both vehicles had similar wheel arrangements, with two axles in the rear with dual tires and a front steering axle. The rear sets of duals carried 15,840 kg (33,850 lbs.) and the front axle carried 5,610 kg (12,340 lbs.). These weights are similar to those on full sized log trucks. The trucks made 10 round trips per weekday over the 6 traffic plots during the period November 15 to December 14. During this period traffic occurred on both rainy and dry days and on saturated and dry road surfaces. The traffic was roughly equivalent to 12 loaded full-length log trucks per day. On each day of traffic, 5 round trips (10 passes) were made over a 1 hr period with a 30-minute break followed by another 5 round trips.

Sediment was collected from the tanks on January 11th and again on June 13th. Tanks with the greatest amounts of sediment were weighed with sediment and water, emptied and weighed again filled only with water to obtain the submerged weight of sediment (see Luce and Black, 1999 for details). For tanks with little sediment, we decanted the clean water off of the tanks using a siphon (avoiding disturbance of the sediment). The sediment was transferred to small steel buckets for weighing on a more precise scale, allowing a more precise determination for the small sediment amounts. Precipitation between Nov 15 and Dec 14 was 351 mm. 151 mm fell between Dec 14 and Jan 11. 589 mm fell between Jan 11 and Jun 13. Average precipitation depths for these periods in Eugene, Oregon are 218, 170, and 551 mm respectively.

During one day of traffic, water samples were collected from the wheel ruts immediately following a vehicle pass to capture the peak sediment concentration. An additional sample was taken 20 minutes into the break between sets of passes, and three samples were taken at 20 minute intervals following cessation of traffic to see how concentration in the wheel rut at the base of the plot changed with time. In addition, concentration samples were taken from the plot outflow (ditch plus tread) at the same time.

We used t-tests on the log transformed sediment yields to test the statistical significance of specific contrasts. The transformation was used because earlier research has suggested that erosion is log-normally distributed (Megahan et al., 2001).

RESULTS AND DISCUSSION

Mean sediment yield during the first sample period, Nov. 15 to Jan. 11, was least for the plots with no traffic and no ditch grading, followed by the plots with traffic but no grading, and the plots with grading but no traffic, and the mean sediment yield was the greatest for segments with both traffic and a graded ditch (Figure 1). All contrasts were statistically significant except for the difference between the traffic and no traffic plots given a graded ditch (Table 1). These results suggest that blading the ditch has a greater effect than traffic on the sediment yield. This particular result may differ given a different soil texture in the ditch or poorer aggregate quality. More significant is the result that the traffic effect depends on whether the ditch is graded. Given that the statistical tests were for log transformed data and the low power inherent in a design with three samples per treatment, we can reject the multiplicative cumulative effect hypothesis, but we cannot statistically discern between the simple additive cumulative effect and the tradeoff hypothesis. Looking at the pattern of the scatter from the No-Traffic-Graded (NTG) plots, we can see that the mean and scatter are strongly influenced by one plot with low sediment yield (Figure 1). The other two NTG plots actually produced more sediment than any of the plots with both traffic and grading. It is worth noting that the sediment production of the one plot is uncharacteristically low for a graded plot given earlier observations (Black and Luce, 1999; Luce and Black, 1999, 2001) and concurrent observations from similarly treated plots. For example three shorter plots (42 m, 42 m, and 60 m) with slightly steeper, 10%, slopes, graded ditches, and no traffic measured during the same period produced 2467, 4533, and 2970 kg/km respectively. Armed with this additional information, removing some weight from the low observation, there is greater support for the tradeoff hypothesis than for the simple additive effect hypothesis.

These results underscore the importance of collecting observations of sediment yield from the entire portion of road prism that is contributing water and sediment when evaluating the effects of treatments, an idea also suggested by Burroughs and King (1989). Observations of individual

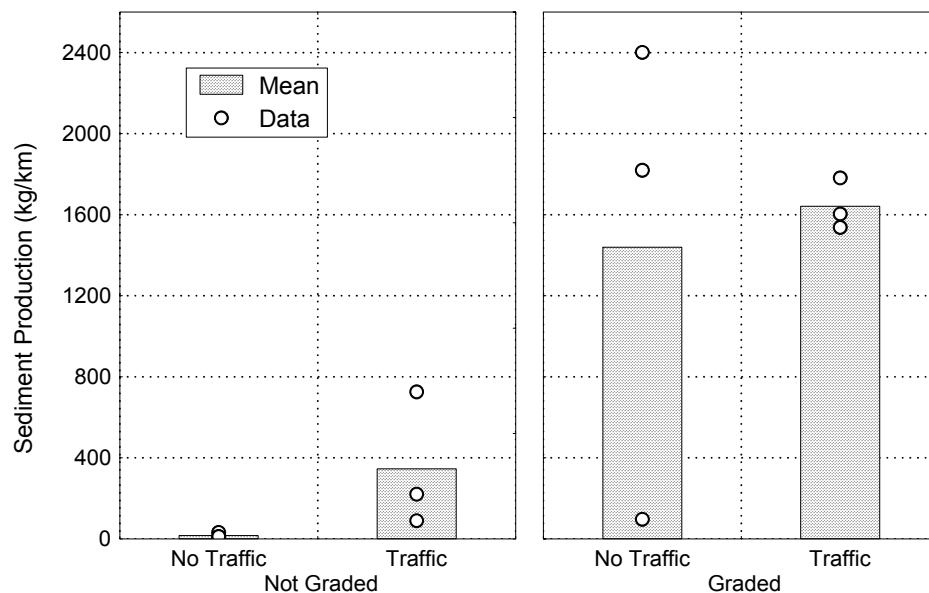


Figure 1: Sediment yield from road segments during the traffic period, November 15, 1999 to January 11, 2000. Bar graphs show mean and data points show specific observations.

Table 1: Statistical Significance of specific contrasts.

Effect of	Given	p value	
		Nov--Dec	Jan-Jun
Grading	No Traffic	0.02	0.02
Grading	Traffic	0.03	0.02
Traffic	No Grading	0.02	0.04
Traffic	Grading	0.49	0.53

parts of the road prism can be misleading if there is potential for interaction of water and sediment from different parts of the road prism. It is also important to recognize the condition of the ditch and the cutslope/ditch contribution to the road segment sediment yield when interpreting results from studies. For example, it is useful to know that the results of Reid and Dunne (1984) showing substantial effect from traffic had little contribution from ditch and cutslope erosion.

Implications for modeling are fairly clear; independent factors applied for ditch maintenance and traffic are not appropriate. Nor would it appear that separate calculation of traveledway and ditch/cutslope contributions is the best option. The stronger support for the tradeoff hypothesis implies that sediment yield increases modeled to result from traffic must consider the condition of the ditch.

There are important implications for the design of BMPs or forest practice regulations. Ditch grading can increase sediment yields on a level comparable to or greater than wet weather hauling. Ditch grading is an important and necessary step in the maintenance of roads when significant sediment inputs (e.g. from a slump or upslope gully) block the ditch, however indiscriminate ditch grading to clean ditches may not be the best use of equipment time. The practice of placing rock in ditches and design criteria for ditch rocking were proposed by Burroughs and King (1989), and our results support their suggestion. The question of whether wet weather haul increases sediment yields on recently constructed or reconstructed roads is important for BMP design. Wet weather haul restrictions provide little and uncertain benefit on roads with recently bladed ditches. Sediment delivery control through crossdrain placement is probably the preferred design, but at locations where delivery is likely (e.g. stream crossings), thorough control of sediment would require protection of both the ditch and the traveledway. Note that the roads in this study were built well enough that the subgrade showed through the aggregate surfacing in only a few places, and the deepest ruts were about 90 mm. The results of this study do not apply to roads where the integrity of the surfacing may be severely damaged by traffic.

For the post traffic period, January 11 to June 13, rankings are similar to those seen in the traffic period, although there was less erosion (Figure 2). The reduced erosion is due in part to armoring during the previous months. The contrasts are similar in statistical significance (Table 1). The difference in graded versus ungraded plots is expected because we know that the effect of grading persists for more than one year in the increased availability from ditch grading (Luce and Black, 2001). The fact that the pattern of differences is maintained suggest that traffic effects may persist beyond the time scale of a few events. Reid and Dunne (1984) noted some persistence beyond the event time scale in their “temporary non-use” segments.

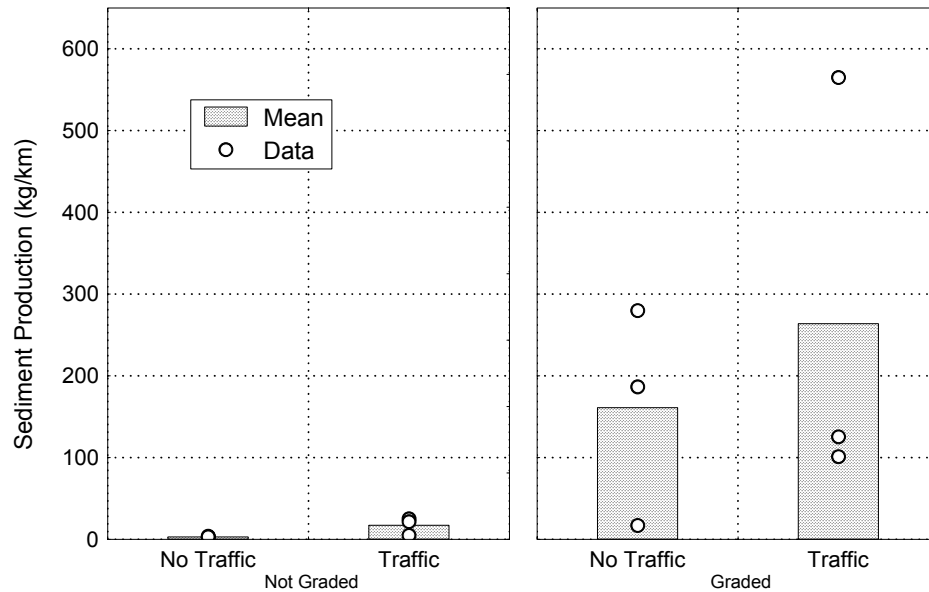


Figure 2: Sediment yield from road segments during the post-traffic period, January 11 to June 13, 2000. Bar graphs show mean and data points show individual observations.

Examination of sediment concentrations during an event showed a rise in concentration as several passes were made, and a rapid drop to lower concentrations after the traffic stopped (Figure 3). Plot runoff showed substantially lower concentrations than the peaks measured by the rut sampling because of dilution from cutslope runoff areas of the road surface where the truck had not recently passed. These patterns agree with other observations of event scale variations in sediment availability (e.g. Reid and Dunne, 1984; Ziegler et al., 2000, 2001). As the vehicle passed, fines were pressed into the tread of the tire while the lugs pressed larger pieces of gravel into the matrix of fines and gravel comprising the road bed. The treaded pattern of fine material was quickly dissipated by precipitation and flowing water. During the course of the traffic, wheel ruts developed varying in depth from 10 mm to 90 mm, and exposure of the subgrade through the aggregate was rare.

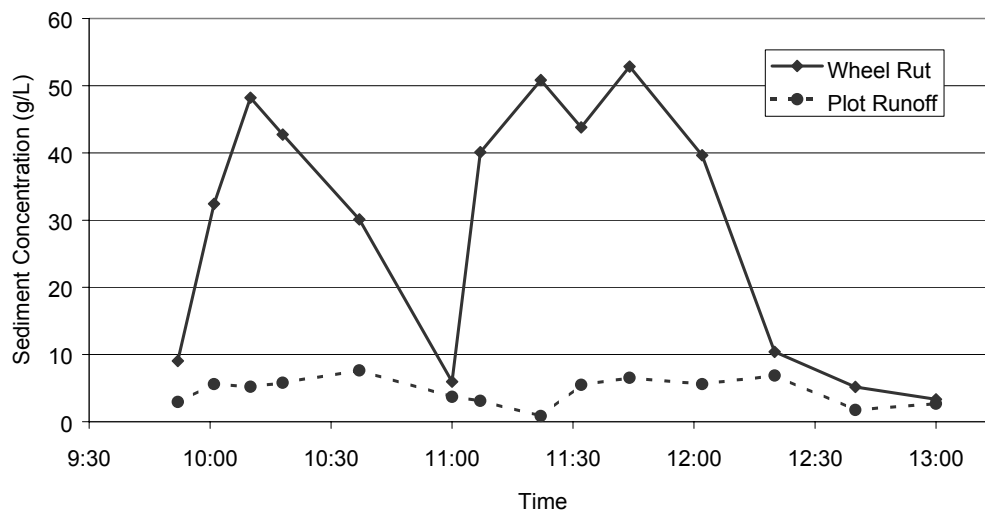


Figure 3: Concentration of sediment over time during one set of passes by a heavy vehicle.

Some persistence in availability of fines would be expected on traffic plots, as the supply of fines from the road over the traffic period would reduce the degree of armoring during that period, and the composition of the material in the ditch beds and wheel ruts should be finer at the end of the traffic period. It is not necessary that the increased availability of fine sediments persist into June for the observed differences in Figure 2. A brief period of increased erosion followed by a long period of essentially equivalent availability could account for the observations. A more likely scenario is an exponential decline in the availability of fine sediment as the finer sediments are selectively removed from the plot (e.g. Megahan, 1974).

CONCLUSIONS

Traffic and maintenance operations are activities normally experienced by forest roads at one time or another during their useful life. Both activities increase the susceptibility of a road to erosion. In order to better manage the spatial and temporal distribution of sediment inputs to streams, it is important to understand how maintenance and traffic affect sediment yield from forest roads.

Grading of the ditch increased sediment yields more than heavy traffic on a road built in a fine-grained parent material with high quality basalt aggregate. The combination of both traffic and ditch grading produced on average more sediment than either treatment alone, however the difference between grading-only and grading-with-traffic was not statistically significant with 3 samples in each treatment. A closer examination of the individual data points and results from similar plots in this year and earlier years provides support to the hypothesis that there is little difference in sediment yields between traffic and no-traffic plots given a graded ditch.

These results suggests that the multiplicative interaction model commonly used to estimate effects of multiple treatments on roads overestimates the effect of traffic on new roads or recently graded roads. A model of traffic effects that is conditional on ditch condition (e.g. time since construction or ditch grading) seems more appropriate. Although the ditch grading effect is much larger, its effect is seldom accounted for in road sediment yield modeling whereas traffic effects generally are, if only as a traffic regime. For roads with regularly scheduled maintenance, it may be desirable to model the effect of a maintenance regime.

Proscription of wet weather haul is an increasingly common best management practice that is effective in reducing sediment production from existing roads. Proscription of wet weather haul on roads with high quality aggregate and recently disturbed ditches may have little benefit. Reducing the amount of road with unnecessary ditch grading is unequivocally effective in reducing sediment production.

Observations in this study and in previous work show that sediment concentrations in runoff and, consequently, sediment yields varied on a time scale of 10s of minutes following traffic. Longer term observations in this study revealed that traffic effects may persist for longer periods, as armoring of the flow paths is prevented by the abundant fine sediment supply. This indicates that a traffic regime model may be appropriate as opposed to needing knowledge of each vehicle pass. It further indicates that any mitigations designed to trap traffic-enhanced sediment yields must be maintained after the traffic ends.

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ATTACHMENT 12 –

EFFECTS OF FIRE ON FISH:

Important Links:

A. The workshop: Fire and Aquatic Ecosystems was held April 22-24, 2002 in Boise, Idaho. The purpose of the workshop was to synthesize new information and current knowledge of the role for fire in, and effects of fire on, aquatic and riparian ecosystems. Papers from this workshop are available at the following site:

<http://www.fs.fed.us/rm/boise/teams/fisheries/fire/firehome.htm>

B. An excellent paper summarizing fire retardant effects on fish is available at the following URL:

<http://www.npwrc.usgs.gov/resource/2000/fchem/fchem.html>

Literature Summary:

Wildfires may result in improved and rejuvenated habitat for salmonids and increased productivity increasing fish populations over the long-term (Minshall G.W. and J.T. Brock 1991; Burton 2000).

In the case of high-intensity wildfires, local extirpation of fishes is patchy and recolonization is rapid. Lasting detrimental effects have been limited to areas where native populations have declined and become isolated from anthropogenic activities (Gresswell, R.E. 1999).

Use of cool burns in spring when the ground is moist, providing an unburned buffer along stream channels, maintaining integrity of the soil surface, and leaving and protecting snags during burning, should help prevent or limit undesirable impacts to fish and wildlife. Staggering prescribed fires over time, and spacing of burns across the landscape will minimize impacts (McMahon E. and D.S. deCalesta 1990).

The following was extracted from : Rieman, B.D. 1995. Proceedings- Fire Effects on Rare and Endangered Species and Habitats Conference, Nov 13-16, 1995. Coeur d' Alene, Idaho IAWF, 1997.

“The potential for wildfire to impact aquatic ecosystems and their associated threatened, endangered, or sensitive species is of increasing concern. Recent (since 1988) large-scale fires followed by dramatic hydrologic disturbances spark much of this interest. Broad swaths of western forest lands, where fire suppression and past silvicultural activities have radically altered vegetation structure and fuel loads, are ripe for high-intensity fires. The potential seems greatest in warm/dry habitat types that historically were dominated by frequent, but low intensity burns. Interconnected, fuel-laden stands may now link areas that historically burned less frequently or uniformly into large, homogeneous areas that are vulnerable to high-intensity, stand replacing events (Agee 1993; Henjum et al. 1994). Recent fires in the Pacific Northwest seem to confirm these expectations.”

“Wildfires influence aquatic ecosystems both directly and indirectly. Direct effects include heating or abrupt changes in water chemistry (Minshall et al. 1989; McMahon and de Calesta 1990). Indirect effects include changes in hydrologic regime, erosion, debris flows, woody debris loading and riparian cover (Swanson and Lienkaemper 1978; Brown 1989; Megahan 1991; Bozek and

Young 1994). Intense fires and related events have killed fish (Bozek and Young 1994) and even caused local extinctions (Propst et al. 1992; Rinne 1996). Conceivably, large and intense fires could threaten populations of sensitive salmonids such as bull trout, chinook salmon, steelhead, and others that are depressed from other causes. Historical fires, however, were a natural and potentially important part of the disturbance regime for terrestrial and aquatic systems (Reeves et al. 1995). Large fires supplied woody debris and triggered hydrologic events and debris flows that transported coarse substrates to stream channels. These processes may well have provided the materials that maintained productive habitats for fish and other organisms (Swanson et al. 1990; Reeves et al. 1995).”

“The magnitude and intensity of recent fires heighten concerns regarding forest/ecosystem health, the potential loss of valuable wood fiber and private property, and the apparent threat to sensitive species. Such concerns have galvanized new efforts to reduce fuel loads and stand densities through mechanical treatment and the use of prescribed fire. These efforts create a quandary for biologists and managers working with aquatic systems. The long-term negative effects of timber harvest activities on aquatic ecosystems are well documented (see papers in Meehan 1991; Salo and Cundy 1987; Henjum et al. 1994) The effects of fire on fish are more equivocal. Do large fires really threaten extinction for many existing salmonid populations? What influences the risk?”

“Large fires in the Boise River basin on the Boise National Forest in 1992 and 1994 provided an opportunity to examine these questions relative to populations of two sensitive salmonids. Bull trout (*Salvelinus confluentus*) is a category-one species under the Endangered Species Act (ESA), and redband or interior rainbow trout (*Oncorhynchus mykiss*) is recognized as a species of special concern by the Idaho Department Fish and Game. Some isolated redband populations have been petitioned for formal listing under ESA. Both species inhabit streams caught within fires described as among the most destructive ever observed on the Forest. We initiated work on the responses of these fishes to wildfire and related effects in 1992. The work was planned as long term and much is incomplete. Our preliminary results and the body of literature regarding the disturbance and recovery of aquatic communities provide a base, however, to initiate the discussion.”

PRESCRIBED FIRE: The following was developed with the Salmonid Species Team and the Prescribed Fire Activity Coordinators at the National Fire Plan workshop in Portland, OR the week of March 12, 2001.

Not Likely to Adversely Affect Criteria for Effects Pathways (Salmonids):

1. Fire intensity/severity does not result in death or injury to individual fish. (Severity/Intensity)
2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are not harmed. (Soil/Vegetation Effects)
3. Fire does not consume (size or amount) large Woody debris to affect stream function. (Intensity/Vegetation Effects)
4. Fire does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected. (Intensity/Vegetation Effects)
5. Rangelands and meadows - Maintain or improve ecological (potential natural condition) conditions in riparian area. (Effective riparian area, not necessarily the RHCA.)

II. Assumption set:

Criteria for Prescribed Fire in RHCAs to result in Not Likely to Adversely Affect Determination:

Within the RHCA, but outside “zone of riparian influence” and outside one site tree height from the stream channel: (includes dry forest, moist forest, and cold forests Potential Vegetation Groups (Quigley et al., PNW-GTR 405, June 1997, pg 969):

- A. In most forested ecosystems, non-lethal fire severity (PNW-GTR 405 ICBEMP, P. Morgan et al.) within the RHCA but outside the zone of riparian influence and outside one site tree height from the stream channel would have the following results:
 - 1. Does not result in death or injury to individual fish.
 - 2. Fire does not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are not harmed.
 - 3. Does not consume (size or amount) Large Woody Debris to a level that would affect stream function.
 - 4. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.
 - 5. Does not impact the ecological (potential natural condition) conditions in riparian area.
- B. In most rangeland ecosystems, lethal fire severity (to shrub overstory) (PNW-GTR 405 ICBEMP, P. Morgan et al.) within the RHCA but outside the zone of riparian influence:
 - 1. Does not result in death or injury to individual fish.
 - 2. Does not consume (size or amount) Large Woody Debris to a level that would affect stream function.
 - 3. Does not cause mortality to overstory or other vegetation such that stream temperatures and water yield are significantly affected.

Prescribed fire criteria to be used for fires within the RHCA, and inside the “zone of riparian influence” and within one site tree height from the stream channel: (includes dry forest, moist forest, and cold forests Potential Vegetation Groups (PNW-GTR 405, June 1997, pg 969):

- C. If the Riparian Prescribed Fire Criteria are met, then individual fish protection will be accomplished and Riparian Management Objectives will be met. Specifically prescribed fire within these portions of the RHCA will:
 - 1. Not result in death or injury to individual fish.
 - 2. Not expose or disturb land areas sufficient to elevate sediment delivery such that habitat/fish are not harmed.
 - 3. Not consume (size or amount) Large Woody Debris to affect stream function.
 - 4. Not cause mortality to tree overstory or other vegetation such that stream temperatures and water yield are significantly affected.

Riparian Area Prescribed Fire Rationale:

The following prescribed fire rationale and criteria were used to ensure that a NLAA determination is appropriate in riparian zones of influence (Quigley et al., PNW-GTR 405, June 1997, pg 969):

Mortality of trees: Fire severity in forested RHCA's will be kept within the **nonlethal severity** for 90% or more of the affected RHCA, and no more than 5% in a lethal fire severity fire effects. Non-lethal severity is defined as:

1. More than 90% of the canopy cover or more than 70% of the basal area that existed prior to the burn is alive after the burn (Quigley, et al., PNW-GTR 405 ICBEMP, P. Morgan et al.).
2. It is recommended that **monitoring** of fire severity effects related to tree mortality should be based on basal area due to ease of measuring and established and accepted methodology that currently exists in forest inventory manuals.
3. **Large woody debris and duff consumption:** Fire intensity effects should not exceed a rating of **low** for 90% of the affected RHCA and no more than 10% of the affected RHCA in a **moderate** intensity rating (see BAER intensity rating system). Fire intensity ratings are as follows:

Low Fire Intensity A zone may be rated as a low-intensity burn if the site factors indicate a moderate or low-intensity on the entire area. Areas of low burn intensity often do not contribute to an emergency watershed condition but they may act as buffer areas to moderate flood hazards that originate on more intensively burned-areas. For this reason it is important to inventory the low-intensity areas. In addition, the information may be useful later in developing treatment strategies.

Moderate Fire Intensity. A zone may be rated as a moderate-intensity burn area if the site factors indicating high-intensity burn are found on less than 40 percent of the area. The rating of moderate fire intensity alerts the team to the possibility that the designated zone may be a potential flood source area. The zone should be further surveyed for water-repellent soils or other indications that it may yield abnormally high overland runoff.

High Fire Intensity. A zone should be rated as a high-intensity burn area if the site factors indicating high-intensity burn are found on 40 percent or more of the area. This would also designate the area as a potential flood source area for further investigation by the team.

OR

Large woody debris and duff consumption: Fire severity effects should not exceed a rating of **low** for 90% of the affected RHCA and no more than 10% of the affected RHCA in a **moderate** severity rating. Fire severity ratings are as follows (Debano, L.F., Neary, D.G., Ffolliott, P.F. 1998. Fire's Effects on Ecosystems. John Wiley & Sons, c1998, 333p.):

Low Fire Severity: Low soil heating, or light ground char, occurs where litter is scorched, charred, or consumed, but the duff is left largely intact, although it can be charred on the surface. Woody debris accumulation are partially consumed or charred. Mineral soil is not changed. Fire severity in forest ecosystems is low if the litter and duff layers are scorched but not altered over the entire depth.

Moderate Fire Severity: Moderate soil heating, or moderate ground char, occurs where the litter on forest sites is consumed and the duff is deeply charred or consumed, but the underlying mineral soil surface is not visibly altered. Light colored ash is present. Woody debris is mostly consumed, except for logs, which are deeply charred.

High Fire Severity: High soil heating, or deep ground char, occurs, where the duff is completely consumed and the top of the mineral soils is visibly reddish or orange on severely burned sites. Color of the soil below 1 cm is darker or charred from organic material. The char layer can extend to a depth of 10 cm or more. Logs can be consumed or deeply charred, and deep ground char can occur under slash concentrations or burned our logs. Soil textures in the surface layers is changed and fusion evidenced by clinkers can be observed locally.

OR

If 1000 hour fuels (fuels greater than 3" in diameter) inside the zone of riparian influence are less than 18 to 25% moisture by weight, then mitigation measures, such as pretreatment of fuels (wetting, scattering, etc) should be done to ensure that concerns for large woody debris consumption and mineral soil exposure are mitigated. (Percent moisture s should be based upon local sampling and/or NFDRS modeling.)

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ATTACHMENT 13

Fire and Aquatic Ecosystems – Pathways(from the literature 2002) - ASPEN

FIRE ECOLOGY

Light burning on heavily cut areas increases the number of suckers and stimulates their initial growth. Very light fires can kill aspen because the bark is thin. Aspen is shade intolerant. As it approaches maturity, conifer invasions are common, significantly increasing fuel loads. In nature these conditions favor wildfire that ultimately rejuvenates the aspen clone. However, hot slash fires (pile and burn) diminish sucker vigor. Repeated burning increases stand density because it stimulates sucker numbers and prepares mineral soil seedbeds for seedling establishment; however, it reduces stand growth. Surface fires in established aspen stands are not common because of aspen's inherently low flammability and high moisture regime. Thus aspen can be used as a fuel break. Fire is a useful tool to stimulate regeneration and to reduce competition if clearcutting is not practiced. It is especially valuable for regenerating deteriorated stands and for maintaining wildlife habitat. Disking stimulates suckering, but sucker growth and survival are usually diminished because of injury to their sustaining parent roots. Rows of suckers often appear along furrows prepared for planting conifers.

Herbicides have been used to kill residual trees and to increase suckering without affecting sucker growth or vigor.

Dormant season cutting generally produces vigorous suckers the next growing season. Summer cutting produces a sparse stand initially, but the number of suckers after 2 years is usually the same regardless of cutting season (15). Suckering sometimes fails inexplicably after harvesting aspen on fine-textured soils during the growing season.

The number of suckers, following cutting, increases as stocking density of the parent stand increases up to full site utilization. The effect of age and site index on aspen suckering is not clear.

Cattle and sheep browsing is a serious problem in many areas of the Rockies because livestock are allowed to range through recent aspen clearcuts. Mature aspen stands adjacent to livestock concentrations (water holes, salt blocks, isolated stands in large open areas) often have root damage, are declining, and have few if any suckers present. Excessive use and vandalism by recreationists has caused aspen to deteriorate in many campsites.

INFISH/PACFISH emphasizes designing fuel treatments and prescribed burns to perpetuate "long-term ecosystem function" and to attain the riparian management objectives. The riparian management objectives are partly defined in INFISH/PACFISH as: streamside conditions that serve as indicators of the attainment of INFISH/PACFISH

goals. The INFISH/PACFISH goals emphasize diverse and productive riparian vegetation characteristic of natural ecosystems, or characteristic of conditions under which the riparian communities developed. Therefore prescribed fires should be designed to move natural, seral aspen communities, from their present condition dominated by conifers and shrubs, back to their historic natural condition of even-aged stands reflective of fire disturbance regimes under which they developed.

EFFECTS PATHWAYS - ASPEN

Gemomorphic and hydrologic influences channel disturbance – channel width, ground water, riparian condition (sediment regime, pool frequency, width-depth ratio) – See terrestrial vegetation influences below. Aspen treatments in large stands comprising most of the subwatershed could significantly alter streamflow regimes during a short time period (3 to 10 years) following fire. If coincident with wetter climate, such changes could re-structure or disturb the channel system having a temporary adverse effect on habitat condition. Because aspen evapotranspire much less than conifers, the ECA standard for increased flood regime is higher (25%) (West 2000).

Riparian Vegetative Influences (sediment regime, temperature, nutrients LWD/microhabitat, microclimate): Fire is one of the natural disturbances shaping riparian stream ecosystems. This suggests a total fire exclusion policy in these areas (riparian zones) is unwise and unnecessary. It was recognized that the unique vegetation, microclimate, and topographic features of riparian zones function to affect fire behavior and spread. In many cases riparian zones have been effectively used in fire control and use (Kaufmann, 2001). In addition, it was recognized that fire is a natural disturbance process in riparian zones. As such, fire has a role in riparian zones and a total exclusion policy of fire is discouraged. It was recognized that other natural disturbances shape the composition and structure of riparian/stream ecosystems. In particular, floods or high flows are significant disturbances. Diversions which influence these processes also affect riparian structure and function. Alterations in structure and function could also affect the fire properties of the riparian zone (Kaufmann, 2001). Comparing riparian zones to uplands, the unique presence of surface water, composition, fuel moisture, fuel chemistry, microclimate, and topography combine to affect fire behavior. There is a limit to the degree in which riparian zones affect fire behavior. Under conditions where fuel moisture is low (near or below the moisture of extinction) and under severe fire weather conditions (high winds, low relative humidity and high temperatures) riparian zones may burn with similar behavior as the uplands (Kaufmann, 2001)

Intermittent RHCAs *“Riparian zones/streams in steep first order high elevation streams have little, if any influence on fire behavior because of few differences in the upland vs. riparian environment.”*

There was less agreement in this statement than the others. In headwater streams, the species

composition may not differ from that of the uplands. These are small areas that are limited in their effectiveness as a fire break (i.e. the fire can easily spot over the small riparian zone).

However, some disagreement was expressed with this statement because of the unique position of headwaters on the landscape.

In headwater streams topographic shade and microclimate are often different enough to slow the rate of fuel moisture loss relative to rates in more exposed uplands (especially south slopes and ridgelines).

Differences in microclimate, fuel moisture content, and presence of surface water, could influence fire behavior even in small headwater streams under certain seasonal and weather conditions (Kaufmann, 2001).

Terrestrial vegetation influences (streamflow regime, landslide): Aspen forests allow more water or ground water recharge and streamflow than do conifer forests. This is primarily due to lower seasonal water losses to interception and transpiration by aspen compared to conifers (34). Clearcutting the aspen type may increase streamflow by as much as 60 percent during the first year. Subsequently, wateryields gradually decline to preharvest levels and stabilize when maximum leaf area is attained at about age 10 to 25. Aspen use 3 to 7 inches less water per year than conifers. The period of non-use coincides with the dormant season -fall, winter, and early spring. Conifers transpire during fall -the base flow period for streams. Thus aspen replacement would have a positive effect on base flows, and a neutral affect on late spring/summer flood flows. (West 2000). Aspen often provides the best possible protection for unstable mountain slopes (landslide prone RHCAs) because it was one of only a few species that can tolerate such instability and still occupy the site, providing some soil water drainage and roots to hold surface soils in place.

Human disturbances (fish passage barriers, press disturbances, fire exclusion):

Existing evidence suggests fires and disturbance in general can pose greater threats to fishes when habitats become fragmented and otherwise altered by human activities (Dunham 2002). There has been a significant reduction in fire rejuvenation of aspen during this century. Historically, aspen burned about once each decade. Few fire scars are typically seen in aspen stands of the latter half of this century. The greater the degree of departure from intact conditions as a result of land and water use activities, the greater the probability of extreme fire events. Perturbations that would result in curves such as this include fire exclusion in low severity regimes, logging, and the long-term effects of livestock grazing. In addition, water diversions and channel incision would increase fire severity on the landscape through a loss or decrease of the riparian zone width, alterations in microclimate, and the loss of surface water for suppression activities (Kaufmann, 2001). Detenbeck et al., (1992 -in Dunham 2002) found that population

recovery time was substantially longer (5 - >52 yr) for press disturbances, in comparison to pulse disturbances (~30d-6 yr).

Direct effects of fire- (stream heating/deoxygenation, ash/nutrient flow) -

Site characteristics- (habitat characteristics) - There are conditions where fire and fire - related disturbance can pose short- term risks to fish populations. Over longer time scales, habitats generated by such events may be more productive than those where natural disturbance has been suppressed or altered by human influences (Reeves et al. 1995; Matthews 1998 in Dunham 2002). The traditional approach to managing disturbance focused on static ecosystem and landscape conditions, and “command and control” management to minimize their influences (Callicott and Mumford 1997). More recent emphasis has been placed on restoration and preservation of natural processes and variability in aquatic ecosystems (Dunham 2002. In larger interconnected systems, fish populations appear to be more resilient to the effects of fire. The importance of connectivity was evident in studies of salmonid responses to fires (Dunham 2002).

ASPEN*		
EFFECT PATHWAY	SHORT-TERM EFFECTS	LONG-TERM EFFECTS
Temperature	Adverse effect, 0 to 5 years in the understory and 0 to 20 years in the overstory: Understory and overstory riparian shade will be decreased. The magnitude of shade decrease and subsequent temperature alteration will depend on the amount of riparian vegetation affected along perennial streams.	Neutral/beneficial 20+ years: Factors affecting stream temperature (shade) should remain similar or slightly improved as compared to current conditions. A slight increase in shade may result from healthier aspen and riparian communities.
Large Wood Debris	Beneficial effect, 0-40 years: LWD should initially show a marked increase due to recruitment of fire killed trees to the stream channel. Most dead trees should fall within the first 20 years. LWD recruited post-fire are expected to decompose within approximately 40 years.	Adverse 40-50 years post-fire, beneficial 50+ years: Regenerated stands of aspen would not begin producing large wood debris until at least 50 years. There may be an approximate 10 year period (40 to 50 years post-fire) where LWD in stream channels may be limited. Rejuvenated aspen stands would likely produce larger and more LWD for future recruitment than existing degraded stands.
Pool Frequency	Neutral/beneficial 0-5 years: See LWD and sediment regime. Pool frequency would be affected by an alteration in sediment regime and LWD. Increased LWD and increased sediment delivery would likely result in similar or slightly improved pool frequency. Increased LWD would likely have a greater influence of pool formation than increased sediment yield would have on pool filling.	Beneficial 5-40 years, neutral 40-50 years, beneficial 50+ years: See LWD and sediment regime. 5 to 40 years – Pool frequency would be improved. Sediment delivery would be reduced and LWD recruitment would continue to increase. 40 to 50 years – Pool frequency could be reduced, potentially less than current condition, due to decomposition of LWD already in the channel and the lack of new recruitment from the immature riparian forest. 50 years and beyond – Pool frequency would improve over existing condition because the rejuvenated riparian stand would be recruiting new and larger LWD to stream channels.
Width/depth ratio	Adverse 0-5 years: Localized channel widening in intermittent and small perennial streams may occur due to streambank erosion, an increase in water yield, and an	Neutral 5-20 years, Beneficial 20+ years: Water yield would continue to be elevated, but riparian vegetation and ground cover would provide

	alteration in the timing of runoff. Effects would decrease as riparian vegetation and ground cover reestablish. The effect to width/depth ratio is dependent on the magnitude of runoff events and the amount of streambank vulnerable to destabilization.	improved streambank protection and improved runoff timing. Vigorous riparian vegetation and healthy aspen stands would improve bank stability over existing condition and would result in a reduction (improvement) in width/depth ratio. Effects from increased water yield should not effect w/d ratio in the long-term. Peak flows are channel-forming flows and have the greatest impact on w/d ratio. Peak flows would not be altered because aspen would transpire at a similar rate to conifer during late spring when channel-forming flows occur.
Sediment regime	Adverse 0-5 years: High intensity prescribed fire in riparian areas would result in bare soil directly adjacent to stream channels. The amount of sediment delivered is dependent on the magnitude of precipitation and snow-melt events. Regrowth of ground cover and bank stabilizing vegetation should occur within 5 years of fire. The greatest risk of increased sediment delivery is during the first two years after fire.	Beneficial 5+ years: Vigorous rejuvenated aspen stands and riparian vegetation should provide improved bank stability and improved ground cover as compared to current condition.
Water quantity	Adverse 0-10 years: Burned areas devoid of or with reduced live vegetation would transpire less water than current conditions. An increased volume of water would be made available to ground water sources and stream channels.	Beneficial 10+ years: After rejuvenated aspen stands become established and begin transpiring water at a similar rate to the parent stand (ten to 20 years post-fire – DeByle and Winokur 1985), there will be an excess amount of water as compared to existing condition. Aspen use three to seven inches less water per year than conifers (Gifford et al. 1983). In addition, conifers are currently encroaching and replacing existing aspen stands. The period of non-use for aspen coincides with the dormant season: fall, winter, and early spring. Conifers transpire in the fall, the base flow period for streams. The increase in base flow may result in minor increases in perennial stream length. The increased water yield is likely to be similar to historical conditions when aspen communities were healthy.
Stream channel processes	See RMOs above. Stream channel processes are influenced by factors covered by RMOs above.	
Nutrients	Neutral 0-20 years: A reduction in shade would result in increased solar input and subsequent increased primary productivity (McMahon et al. 1990). Fish populations would likely also increase if nutrients were the limiting factor for the population. However, the subsequent alteration in winter and spring temperatures which also occur may offset the potential productivity increases by altering the timing of critical life history stage such as emergence of fry from spawning gravels (Ringle and Hall 1988).	Beneficial 20+ years: Improved riparian aspen stand health would result in increased nutrient loading to stream channels as compared to existing condition.

**Reighn 2002*

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ATTACHMENT 14

Fire and Aquatic Ecosystems – Pathways(from the literature 2002) Oak Woodland

FIRE ECOLOGY Burns hot. In small headwater streams oak comes down to the stream channel. Temperature and sediment effects result. Exclusion of RHCA is difficult, particularly in the headlands. In steep terrain burning logs can roll back into the RHCA and torch the RHCA. A prescribed fire that escaped into wildfire extirpated cutthroat trout in southern Utah. Need to pay attention to the entire drainage network, including the zero order channels.

EFFECTS PATHWAYS – Oak Woodland

Geomorphic and hydrologic influences channel disturbance – channel width, ground water, riparian condition (sediment regime, pool frequency, width-depth ratio) - Don't know if it affects streamflow regime. Need to apply the sediment buffers to all drainages including zero order drainages.

Riparian Vegetative Influences (sediment regime, temperature, nutrients LWD/microhabitat, microclimate) - Oak is predominantly in lower elevations and the green riparian zone is very small, with Oak within just a few feet of the streambank. Can occur adjacent to 2nd order and 3rd order streams.

Terrestrial vegetation influences(streamflow regime, landslide) - No known ECA standard.

Human disturbances (fish passage barriers, press disturbances, fire exclusion) -

Direct effects of fire- (stream heating/deoxygenation, ash/nutrient flow) - Given that it burns hot adjacent to riparian zones, direct effects are likely.

Site characteristics- (habitat characteristics) - Occurs at lower elevations.

ATTACHMENT 15

Erosion and Sediment Delivery Following Removal of Forest Roads

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Erosion and Sediment Delivery Following Removal of Forest Roads

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ABSTRACT

Erosion control treatments were applied to abandoned logging roads in California, with the goal of reducing road-related sediment input to streams and restoring natural hydrologic patterns on the landscape. Treatment of stream crossings involved excavating culverts and associated road fill and reshaping streambanks. A variety of techniques were applied to road benches, which included decompacting the road surface, placing unstable road fill in more stable locations, and reestablishing natural surface drainage patterns. Following treatment and a 12-year recurrence-interval storm, some road reaches and excavated stream crossings showed evidence of mass movement failures, gullying, bank erosion and channel incision. Post-treatment erosion from excavated stream crossings was related to two variables: a surrogate for stream power (drainage area * channel gradient) and the volume of fill excavated from the channel. Post-treatment erosion on road reaches was related to four explanatory variables: method of treatment, hillslope position (upper, mid-slope or lower), date of treatment, and an interaction term (hillslope position * method of treatment). Sediment delivery from treated roads in upper, middle and lower hillslope positions was 10, 135, and 550 m³ of sediment/kilometer of treated roads, respectively. In contrast, inventories of almost 500 km of forest roads in adjacent catchments indicate that untreated roads produced 1500 to 4700 m³ of sediment/km of road length. Erosion from 300 km of treated roads contributed less than 2 percent of the total sediment load of Redwood Creek during the period 1978 to 1998. Although road removal treatments do not completely eliminate erosion associated with forest roads, they do substantially reduce sediment yields from abandoned logging roads.

Introduction

Forest roads are significant sources of sediment (Megahan and Kidd, 1972; Janda and others, 1975; Kelsey and others, 1981; Best and others, 1995). Abandoned and unmaintained roads once used for timber harvest are common across the steep, forested landscape of southwest Canada and the Pacific Northwest of the United States. Haul roads constructed across steep slopes frequently result in massive landslides and extensive gullying that contribute sediment directly into stream channels. Sidecast material from road construction can be mobilized when it becomes saturated, or gullies can form if road runoff is diverted onto previously unchanneled slopes.

Road cuts and drainage structures, such as culverts, can disrupt natural drainage patterns. Stream crossings fail when culverts plug with sediment or wood, or are too small to convey storm discharge. In these cases, the road fill at the stream crossing may be removed by erosion. Drainage structures can divert streams out of their natural course onto unchanneled hillslopes when the structures fail to function properly. For example, if a culvert plugs and the road slopes away from the culvert inlet, runoff is diverted from the channel and may flow down the road onto an unprotected hillslope. These diversions frequently result in further gullying or road fill failures (Weaver *et al.*, 1995). Road cuts can intercept groundwater and increase the amount of surface runoff (Wemple, 1998). As a result of this hydrologic rerouting, some streams receive an increase in discharge, and the channels enlarge through downcutting and bank erosion. In addition, widespread surface runoff from the road bench and cutbanks flows into inboard ditches, which commonly deliver fine sediment to channels.

In response to the erosional threat posed by abandoned forest roads, the United States

USDI National Park Service and USDA Forest Service fund programs to upgrade existing roads and to remove roads that are no longer needed for the transportation network. In 1978, the National Park Service initiated one of the earliest and most extensive restoration programs focused on roads at Redwood National Park in north coastal California. At that time, Redwood National Park was expanded to include 15,000 ha of recently logged lands. Most of the redwood forest on this land had been tractor logged, which resulted in an extensive network of unpaved haul roads and tractor trails (skid roads). The newly acquired Park lands included more than 650 km of abandoned haul roads and 4800 km of smaller skid trails. Due to a concern regarding downstream impacts of roads on streamside redwood forests and salmon-bearing rivers, the USDI National Park Service initiated an erosion control program to reduce sediment production from these abandoned roads. The purpose of the program, as stated in Public Law 95-250, was to reduce human-induced erosion within Redwood National Park and encourage the return of natural patterns of vegetation.

The main focus of the restoration program has been to reduce sediment delivery from abandoned logging roads and restore natural drainage patterns. Typical treatments include decompacting the road surface, removing drainage structures (primarily culverts), excavating road fill from stream channels and exhuming the original streambed and streambanks, excavating unstable sidecast fill from the downslope side of road benches or landings, filling in or draining the inboard ditch, and mulching and replanting the sites. An evolution of road rehabilitation techniques, beginning in 1978, will be discussed in more detail below. About 300 km of abandoned logging roads were treated between 1978 and 1996 (Figure 1).

The restoration program at Redwood National Park operated for many years under benign weather conditions, and between 1978 and 1996 Redwood Creek had no floods of greater than a five-year recurrence interval. In 1997, the treated roads received their first 'test' in the form of a 12-year recurrence interval storm. Although storm damage reports documented many landslides and culvert failures on untreated roads (Redwood National and State Parks, unpublished reports), the effect of the storm on treated roads was not known. An evaluation of treated roads was initiated to assess the success of the park's rehabilitation program in meeting its goal of sediment reduction from treated roads following a large storm.

The purpose of this paper is to evaluate the erosion and sediment delivery from treated roads based on measurements after the 1997 storm. The format of the study is retrospective rather than experimental because the road treatments from 1978 to 1996 were not applied in an experimental design. Several questions are posed in the present assessment: Are post-treatment erosion rates from removed roads related to hillslope position, hillslope gradient, or hillslope curvature? Did the type of underlying bedrock influence post-treatment erosion rates? Did the effectiveness of different road treatment methods vary significantly in terms of reducing sediment yields? Because revegetation of treated sites increases with time, was post-treatment erosion related to time since rehabilitation? Was post-treatment stream channel adjustment related to stream power? From a basin-wide perspective, have road removal treatments significantly reduced sediment delivery from forest roads into streams?

Previous Studies

Many researchers have documented the effects of timber harvest and associated road construction in the Redwood Creek catchment. Janda *et al.* (1975) described hillslope and channel conditions in the Redwood Creek catchment, including the extent of timber harvest and some of its effects on the landscape. Their initial work spawned a series of more detailed studies of specific erosional processes. Marron *et al.* (1995) found that surface erosion from overland flow on forested and logged slopes in sandstone terrain in the Redwood Creek basin was minor, but sheetwash on tractor-logged slopes in schist terrain can be a significant sediment source. Gullying was a major erosion process on roaded prairies and logged lands in the Redwood Creek basin, and most of the gullies originated on unpaved logging roads (Weaver *et al.*, 1995). A sediment budget for Garrett Creek, a tributary to Redwood Creek, showed that road construction and logging accounted for almost all significant sources of hillslope erosion (Best *et al.*, 1995). Landslides associated with roads and recently logged hillslopes accounted for nearly 80 percent of total landslide erosion measured in the Redwood Creek catchment (Pitlick, 1995). Finally, Nolan and Janda (1995) reported that synoptically measured values of suspended-sediment discharge were roughly 10 times greater from harvested terrain than from unharvested areas.

Although increased erosion rates and sediment yields following road construction and logging have been well documented in the Redwood Creek catchment, few studies address the change in erosion rates following road removal. Klein (1987) measured channel adjustments during the first year following excavations of 24 stream crossings in Redwood National Park. Following a five-year return interval flood, crossings eroded an average of 0.8 m³/m of length of stream in the excavated crossing. Post-treatment erosion was most strongly related to stream power and inversely related to the percent of coarse material in stream banks and large wood in the channel. Luce (1997) found that road ripping (decompacting the road bench) was effective in increasing the hydraulic conductivities of road surfaces, but did not restore the conductivities to those of a forested slope. Bloom (1998) contrasted the erosion derived from treated and untreated road segments in Redwood National Park following the 1997 storm, and reported that storm-related erosion on untreated roads was four times greater than on treated roads, and that erosion was related to hillslope position and proximity to fault zones.

Field Area

The Redwood Creek catchment, located in the northern Coast Ranges of California, USA, is underlain by rocks of the Franciscan Assemblage, mostly sandstones, mudstones and schist. Redwood Creek drains an area of 720 km² and the basin receives an average of 2000 mm of precipitation annually, most of which falls as rain between October and March. Total basin relief is 1615 m and the average hillslope gradient is 26 percent. Typical hillslope profiles consist of broad, convex ridges with steeper streamside slopes, where streamside landslides are common. Locally, a break in slope separates the more gentle upper hillslopes and steeper (>65 percent) streamside hillslopes, which is called an inner gorge (Kelsey, 1988). Floodplain development is limited in the Redwood Creek catchment, and the streams considered in this study are highly constrained (valley width is less than two channel widths). None of the roads included in this study was located on a floodplain or terrace.

Prior to timber harvest, a conifer forest dominated by coastal redwood (*Sequoia sempervirens*) and Douglas fir (*Pseudotsuga menziesii*) covered most of the catchment, although scattered grasslands and oak-woodlands lined the eastern ridgetops. By 1997, 80 percent of the original coniferous forest had been logged, and parklands encompass the remaining old-growth forests. The primary silvicultural method was clearcut logging with tractor yarding, which resulted in extensive ground disturbance and large areas of bare soil. Widespread construction of haul roads and smaller skid roads accompanied the timber harvest activities. The density of logging haul roads is 5 - 7 km/km².

Description of Road Treatments

The first step in treating forest roads was to map the geomorphic and hydrologic features of the road and adjacent hillslopes. Erosion features, drainage structures, the stream network, and the location of all roads, skid trails, seeps, and springs were identified on enlarged aerial photographs at a scale of 1:1200. Following the mapping phase, road removal treatments were designed and implemented. In the early 1980's, road treatment work focused on removing culverts and pulling back road fill from streambanks (Figure 2a-d). In some cases, newly excavated stream channels were protected with check dams or large rocks (Figure 2b). The crossing excavations surveyed in this study varied from 100 to 7500 m³ in volume, and averaged about 1000 m³. Stream gradients of excavated stream crossings ranged from 1 to 50 percent.

On road reaches between stream crossings, a variety of techniques were used, which varied in the amount of earth moving involved (Figure 3a-d). Treatments in the early 1980's decompacted the road surface and constructed drains perpendicular to the road alignment to dewater the inboard ditch (a technique referred to as "ripped and drained"). Typically, 200 to 500 m³ of road fill were moved for every kilometer of road treated with this method. This approach is the least intensive treatment (Figure 3b). Following this treatment, the roads were mulched with straw and seeded and replanted with native vegetation (Figure 4a and b).

As the program progressed, park geologists began to use more intensive treatment methods, which included partially outsloping the road surface by excavating fill from the outboard edge of the road and placing the material in the inboard ditch at the base of the cutbank (Figure 3c). This technique required more earth moving (1000 to 2000 m³/km of treated road). By the 1990's, geologists commonly prescribed complete recontouring of the road bench (total outslope), in which the cutbank was covered by excavated fill, original topsoil from the outboard edge of the road was replaced on the road bench where possible, stream channels were excavated to the original channel bed elevation, streambanks were extensively reshaped and the road bench was fully recontoured (Figures 3d, 5a and b). Total outsloping involved moving an average of 6000 m³/km of treated road. Channel armoring was seldom used in this phase, but trees felled during road treatment were later placed in the stream channels and on the treated road surface. On some road segments, excavated road fill was removed from the road bench and transported to a more stable location, and this technique is termed export outslope (Figure 3e). The locations where the road spoils were placed are called fill sites. Export outsloping involved the greatest amount of earth moving (15,000 to 20,000 m³/km of treated road). Because surface erosion is not considered to be a major sediment source (Kveton *et al.*, 1983), and natural revegetation is

rapid in this region, little mulching or replanting has been done in recent years.

The cumulative length of road treated by the different methods is shown in Figure 6a. Most roads that were ripped and drained were treated prior to 1988, and most export outslipping occurred after 1988. This means that most minimally treated roads were subject to more storms than roads which had more intense levels of treatment. A greater length of road was treated in early years, when treatments were still being refined. Due to budget constraints and more intensive treatment in later years, fewer road segments were treated in more recent years. Figure 6b shows the cumulative length of road treated by hillslope position. More lower hillslope roads were treated in the first few years of the restoration program than roads in upper and middle hillslope positions, and overall more lower hillslope roads were treated. The implications of these interactions among date of treatment, treatment method and hillslope position will be discussed more fully later.

Methods

All treated roads within Redwood National and State Parks were subdivided into 1.6 km road segments. Because Bloom (1998) found that hillslope position was an important variable in evaluating erosion, road segments were stratified into three hillslope positions (upper, mid-slope and lower). The classification was based on the distance of the road from the adjacent ridgetop to the nearest high-order stream channel. In this catchment, hillslope position is related to slope gradient, with upper, middle and lower hillslopes averaging 25, 35, and 40 percent, respectively. It was difficult to accurately measure hillslope gradient at treatment sites, because thick vegetation and large road prisms obscured the original topography. For this reason, hillslope position is used as a surrogate for hillslope gradient. Because the streams in this study are highly constrained within steep, V-shaped valleys, 'lower hillslope roads' do not include any roads on floodplains or terraces, but are typically in the steepest topography.

Forty road segments were selected randomly for field mapping, but two segments, later deemed inaccessible, were not surveyed. During the field mapping phase each road segment was further subdivided into 'stream crossings' where a culvert had been removed, and intervening 'road reaches' that were treated by a variety of methods. Geomorphic maps that were constructed when the roads were first treated were used to supplement field observations to reconstruct site conditions at the time of treatment. Each sampled road segment comprised several treatment sites, representing both stream crossings and road reaches. Consequently, the inventory of 38 segments of treated roads (61 km) resulted in a data set consisting of 207 crossings and 301 road reaches. Each excavated stream crossing and treated road reach had a separate inventory form with pertinent site information, map and erosion measurements.

Volumes from several types of post-road removal erosion were measured: mass movement, bank erosion and channel incision, and gullyng. Because previous studies had shown surface erosion from treated roads delivered a small proportion of the total sediment in this catchment (Kveton *et al.*, 1983) surface erosion on the treated road bench or crossing was not measured. Sediment delivery was estimated by measuring the void left by bank erosion or mass movement features and measuring the dimensions of the downslope deposit, if present. The estimated error of measuring the volume of voids and deposits was ± 25 percent.

Commonly, the toe of the landslide entered a stream channel, and the eroded material had been transported from the site by the time of field mapping. Type and density of trees and percent ground cover of herbaceous vegetation on the site were also recorded. Many road reaches were thickly vegetated, which obscured small post-treatment erosion scars.

Regression analyses were used to evaluate which site factors were important in explaining post-treatment erosion. Factors used in the analysis of erosion and sediment delivery from treated road reaches were: hillslope position (upper, mid-slope, or lower); bedrock (schist, sandstone, or other); treatment type (ripped and drained, partial outslope, total outslope, export outslope or fill site); time period of restoration activity (1980-1983, 1984-1987, 1988-1991, and 1992-1996); and hillslope curvature (convex, planar, or concave). For stream crossings, the factors used were: bedrock type, date of treatment, drainage area, channel gradient, volume excavated from channels, step frequency and elevation drop due to steps. Because road reach boundaries were based on the spacing between stream crossings, road reaches were of unequal length. Consequently, erosion from road reaches was normalized by the length of road reach (m^3/m of road). In contrast, crossing erosion was expressed as ' m^3 eroded per excavation.' It might also be preferable to express channel erosion volumes as a normalized value (m^3/m of channel), but in the field it was difficult to accurately determine the length of the excavated channel. Post-treatment channel adjustment upstream and downstream of the excavated channels blurred the boundaries of the excavated channel, and in many sites post-treatment erosion extended beyond the limits of the crossing excavation itself.

The treatment method for stream crossings (removal of culverts and reshaping streambanks) differed from that of road reaches (decompacting, draining or recontouring the road bench). Also, fluvial erosion (channel incision and bank erosion) caused most post-treatment erosion in excavated stream crossings, whereas mass movements accounted for three-fourths of the erosion from road reaches. For these reasons, the analysis considered data for stream crossings separately from road reaches.

The results of the erosion measurements are reported as two values: 1) "total erosion since treatment" in cubic meters (a measure of the volume of voids from mass movement, channel erosion or gully on the treatment site) and 2) "sediment delivery to streams," in cubic meters, (the volume of the voids minus the volume of downslope deposits). Although the measure of voids on the treatment site was fairly straightforward, the determination of how much of the eroded material actually reached a stream was more subjective. Consequently, the estimates of sediment delivery from some sites are not as accurate as those of total erosion.

The date of treatment of the inventoried sites ranged from 1980 to 1996, and by 1997 when the sites were mapped, most road reaches and crossings were heavily revegetated with shrubs, hardwoods and some conifers. Thick revegetation (for example, Figure 2d) on most of the treated road reaches hindered a close inspection of the ground surface, and the minimum volume of erosion measured was 2 m^3 . This was considered the detection limit for erosion on road reaches, and by this definition only 20% of the road-reach sites had detectable erosion. Helsel and Hirsch (1997) consider data to be severely censored when data sets have >50% of the values categorized as below the detection limit. In this situation, they recommend logistic regression as the appropriate analytical tool, and a response variable of 'erosion' or 'no erosion'; on road reaches was used.

The explanatory variables are not necessarily independent. For example, the treatment technique of ripping and draining was more commonly used in the early time period of 1980 to 1983, than in later periods (Figure 6a). Another confounding factor is that the roads considered the most unstable were treated early in the program (Figure 6b). Contingency tables were used to check for independence among the variables, and several interaction terms were tested for significance in the regression analyses. Step-wise logistic regression with forward selection, including interaction variables, was used to determine which variables to include in the most reasonable regression model.

In contrast to road reaches, 96% of treated stream crossings exhibited detectable levels of erosion (although most channel adjustment was minor). The entire length and width of the excavated channel were surveyed, so detection of erosion was not a problem. In this case, standard multiple regression techniques were applied. An interaction term included in the regression analysis was (drainage area * channel gradient), a surrogate for stream power. Step-wise regression with forward selection, using an F-to-enter of 4 ($p=0.05$) determined which variables to include in the final regression model.

Results and Discussion

Distribution of treated roads across sampling strata

Due to the history of the restoration program at Redwood National Park, not all road types and road treatment techniques are equally distributed across time and space. Contingency table tests showed that, at a 99% confidence level, several variables were not independent of one another: year of treatment, method of treatment, and hillslope position. This fact is illustrated in Tables 1 and 2, which show the percentages of road length sampled in different categories. For example, 50% of the sampled road length was on lower hillslope positions. This does not mean

Table 1: Percentage of sampled road length according to hillslope and treatment types

	Road Rehabilitation Technique					
Hillslope Position	Ripped and Drained	Partial Outslope	Total Outslope	Export Outslope	Fill Site	Total
Upper	13%	5%	9%	<1%	3%	30%
Mid-slope	8%	2%	9%	<1%	1%	20%
Lower	21%	6%	7%	12%	4%	50%
Total	42%	13%	25%	12%	8%	100%

Table 2: Percentage of sampled road length according to bedrock, hillslope curvature, and date of treatment

Bedrock Type		Hillslope Curvature		Date of Treatment	
Schist	72%	Concave	25%	1980-1983	30%
Sandstone	22%	Planar	19%	1984-1986	32%
Other	6%	Convex	56%	1987-1991	27%
				1992-1996	11%

there was originally greater road length on lower hillslopes, but that the restoration program targeted such roads for early treatment, leaving more upper hillslope roads untreated. Export outslipping was more commonly prescribed on lower hillslope roads, so few of the randomly selected road reaches in upper and mid-slope positions had this treatment technique applied. Early in the program, more roads were minimally treated, and total outslipping was more common in later years. Because of budget constraints and the use of more expensive techniques, fewer roads were treated in the period 1992-1996, so the length of treated road in this category is less than for other time periods. Consequently, any extrapolation of the results of this study must consider the constraints placed by the distribution of sampled road reaches across the various strata.

Stream Crossings

From 1980 to 1997, The total amount of material eroded from 207 crossings following treatment was 10,500 m³, or about 50 m³ /crossing. Although this represents a direct contribution of sediment to perennial streams, it is likely that, if these crossings had not been treated, much more sediment would have eventually been eroded and delivered into streams. For example, 220,000 m³ of road fill was excavated from the crossings during treatment (1060 m³ /crossing) which represents the maximum volume of erodible material if those crossings had remained intact. In reality, not all the road fill actually erodes when a crossing fails. In the Garrett Creek catchment (a basin adjacent to the study area), Best *et al.* (1995) determined the average erosion from 75 failed crossings that had not been treated was 235 m³. On the other hand, by excavating crossings and restoring natural drainage patterns, diversion of flow from the natural channel is prevented. Best *et al.* (1995) showed that at locations where roads did cause streams to divert (at one-fourth of the crossings sampled) the average erosion was 2650 m³. These lines of evidence suggest that the likely volume of erosion from the excavated crossings would have been at least four times greater, and probably more, if they had not been treated.

Most excavated stream crossings produced very little sediment. (Crossings which had debris torrents originating upslope and off-site of the crossing excavation were not included in this analysis because the purpose was to look at the effectiveness of the road treatment itself). Twenty percent of the excavated stream crossings produced 73 percent of the total volume eroded from stream crossings (Figure 5a). Klein (1987) and Bloom (1998) suggest that most channel erosion occurs in the first few floods following treatment, and later adjustments of the channel form are smaller in magnitude. Virtually all the road fill eroded from the treated channels was transported off site by the time the crossings were inventoried.

Channel incision and bank erosion were the most common forms of post-treatment erosion in crossings. Only two explanatory variables were significant in the best-fit regression model:

$$\text{Volume eroded from crossing (m}^3\text{)} = 20.8 + 0.041 (\text{drainage area} * \text{channel gradient}) + 0.009 (\text{volume excavated, m}^3\text{)}$$

The surrogate for stream power (drainage area * channel gradient) ($p < 0.001$) and the volume of material excavated from a channel during treatment ($p = 0.0085$) were significant variables in explaining the volume of post-erosion in excavated stream channels. The greater the stream power and the larger the excavation, the more the channel eroded following treatment. Deeply incised channels that required more fill to be excavated were more vulnerable to post-treatment erosion than shallow crossings with less road fill because the reshaped streambanks were steeper, more extensive, and more likely to fail. The regression model was statistically significant at the 99% confidence level; however, the fitted model only explains 18% of the variability in post-treatment erosion. Erosion following treatment is highly variable, and many site-specific conditions (such as the presence of bedrock, springs, or poorly drained soils or incomplete excavations) can influence post-treatment erosion as well.

Road Reaches

The total amount of material eroded from treated road reaches was 25,900 m³. Most (77%) of this erosion was attributed to mass movement processes, primarily road fill failures. Of the total erosion from road reaches, 74% of the eroded material was delivered to a stream channel. Most treated road reaches performed well and produced very little sediment. The cumulative distribution of erosion from road reaches is even more highly skewed than that for road crossings (Figure 5b). Twenty percent of the treated road reach length produced 99% of the total erosion from treated road reaches. Total post-treatment erosion from 61 km of road, including both fill failures and stream crossing erosion, was 36,400 m³ (600 m³/km of road); total sediment delivery was 29,500 m³ (480 m³/km of road).

A logistic regression model, based on 'erosion' or 'no erosion' of the treated road sites, resulted in four significant explanatory variables: hillslope position, date of treatment, treatment type, and an interaction term (hillslope position * treatment type). The results of the logistic regression can be expressed by the odds of failure (that is, erosion occurred on the road reach). For example, the odds of failure of roads treated in the early part of the program (1980-1983) were 6.7 times greater than the odds of failure for roads treated later (1992-1996). Similarly, the odds of failure for roads in lower hillslope positions were 5 times those of upper hillslope roads, and the odds of failure for mid-slope roads were 3 times those of upper slope roads. The logistic

regression was rerun, redefining 'failure' to be erosion $> 50 \text{ m}^3$ rather than only $> 2 \text{ m}^3$. The odds ratios were similar, in that lower slope roads treated early in the restoration program were the most likely to have failed (Madej, 2000).

Although the model was significant at the 99% confidence level, the percentage of deviance explained by the model is only 16%. Erosion on treated road reaches was highly variable, as it was for treated stream crossings. Besides the geomorphic variables considered in this analysis, road reach erosion is also influenced by site specific conditions, such as the presence of seeps, depth to bedrock, or history of past mass movement activity. Even though bedrock type was not a significant variable in this regression model, a finer distinction of bedrock based on the degree of fracturing, shearing and erodibility in individual units may be worth exploring in the future.

The interaction of hillslope position and treatment type was significant in the logistic regression model, and this interaction is described more fully in Table 3. The 'odds of failure' result defined by the logistic regression does not give information on the size of failure. Accordingly, Table 3 pertains to the magnitude of the failure, and contrasts sediment delivery under different treatment and hillslope conditions. On upper hillslopes, sediment delivery from all treatment types is low. Even minimal treatment seemed to be sufficient in preventing erosion on these sites. This suggests that, except for sensitive geomorphic locations such as headwater swales, a low intensity (and concomitantly, less expensive) treatment is adequate for upper hillslope roads. Sediment delivery from mid-slope roads was also low, except for those that had minimal treatment. For effective sediment reduction, more intensive treatment, such as partial or total outslowing, is warranted on mid-slope roads. Lower hillslope roads, which were built on the steepest topography in the catchment, exhibited the highest erosion rates, no matter which treatment was used. It is interesting to note that the most intensive treatment method (export outslowing) was associated with the highest sediment delivery to streams from road reaches in lower hillslope positions.

Table 3: Volume of sediment delivered to channels from treated road reaches, reported as m³/km of road length.

	Road Rehabilitation Technique				
Hillslope Position	Ripped and Drained	Partial Outslope	Total Outslope	Export Outslope	Fill Site
Upper	10	10	10	N/A*	0
Mid-slope	310	0	20	N/A*	80
Lower	640	550	630	920	40

*Less than 5 samples in this category.

The expectation of the road rehabilitation program had been that the more intensive the treatment, the less post-treatment erosion would occur. Nevertheless, this result of high erosion rates should not be automatically interpreted as a general failure of the technique. Professional judgement is used when restoration treatments are formulated for a given road reach. Park staff who prescribed the high intensity treatment of export outsloping recognized some inherent instability of the road reach, based on evidence of past mass movement, the presence of seeps in the cutbanks, incipient failure of the road bench, etc. Consequently, these road reaches were among the most unstable even before road treatments were applied, and so might be expected to erode more following any type of treatment. On the other hand, because more land area is disturbed using this treatment method, and the capacity of the road bench to store material from cutbank failures is eliminated, it may be that the treatment allows for greater sediment delivery than other treatments. A closer examination of the conditions under which export outsloped road reaches fail and deliver sediment is necessary to distinguish the causal mechanism.

Road rehabilitation efforts following road construction in steep, lower slope positions have a high failure rate and contributes much sediment to streams, no matter what type of treatment is used (Table 3). If sediment reduction from roads is the objective in a catchment, these observations suggest the need to avoid road construction (or improve road construction techniques) in these steep, streamside areas. Not only are these likely spots for erosion while the road is in place, but also subsequent treatment of the road may not be effective in eliminating road-related sediment production.

Basin-wide Perspective of Sediment Production

No direct measurements of sediment yield from treated roads during the 1997 storm are available. The numbers from this inventory can be roughly compared with measurements made at the gauging station at the mouth of Redwood Creek (drainage area = 720 km²). The total sediment load for Water Years 1978 to 1998 was about 13,600,000 Mg. The inventory of 61 km of treated roads showed a contribution of 29,500 m³ of sediment to streams (480 m³ per km of treated road) during this same period. If the randomly sampled roads are representative of all treated roads, and this rate is applied to the entire 300 km of treated roads in Redwood National Park, 144,000 m³ of sediment probably entered streams from treated roads. Consequently, sediment yield from treated roads represents a contribution of about 233,000 Mg to the basin's sediment load (assuming a bulk density of 1.62 gm/cm³), which constitutes less than 2 percent of the total load of Redwood Creek at Orick during this period. Of the sediment contributed from treated roads, some of the coarse particles eroded from the road fill were transported as bedload, some broke to suspended size particles during transport, and some sediment was temporarily stored in small stream channels, but little is known about the specifics of sediment routing through these steep, low-order channels.

Without treatment, roads have some potential to eventually fail and contribute sediment to streams. Based on an inventory of 330 km of untreated roads in nearby basins, Weaver and Hagans (1999) estimated past road-related sediment delivery to be 720 m³/km of road, and future potential sediment delivery without road treatment to be an additional 820 m³/km, for a total of 1540 m³/km. In a similar study based on 140 km of untreated roads in the Redwood Creek catchment, Bundros and Hill (unpublished data) reported past and potential sediment delivery from roads to be 1450 m³/km. Untreated roads in the Garrett Creek catchment produced much more sediment (4670 m³/km), most of which originated from debris torrents caused by stream diversions (Best *et al.*, 1995). By removing culverts and restoring natural drainage patterns, park staff have removed the risk of stream diversions that would cause such debris torrents. None of the 207 excavated crossings examined in this study had diversions or debris torrents related to road treatment. These different lines of evidence suggest that, although road restoration in Redwood National Park did not completely prevent sediment production from removed roads, it does substantially reduce the long-term sediment risk from abandoned roads.

In contrast to the road inventories described above, a recent study by Rice (1999), also conducted in the Redwood Creek basin, reports an erosion rate of only 176 m³/km of untreated logging road during the period 1995 to 1997. The hillslope position of these sampled road plots was not reported. The roads in Rice's study area were only subjected to a rainfall event of less than five-year return interval, based on rain gage records at Redwood Creek near Blue Lake and at Lacks Creek. Under these relatively low rainfall intensity storms, few culverts failed, as might be expected. Most road-related erosion in the past has been linked to culvert failures, diversions, and landslides that occur during high intensity rainfall events. It is likely that the erosion rate reported by Rice (1999) does not represent the full erosion potential from untreated roads if these roads underwent a high intensity rainfall event.

Conclusions

Post-treatment erosion of both stream crossings and road reaches following removal of forest roads was highly variable. On average, treated roads contributed 480 m³ of sediment to streams per kilometre of road, which was about one-fourth the sediment produced from untreated roads. Only 20% of the excavated stream crossings accounted for 73% of the post-treatment erosion from crossings. In stream crossings, two variables (a surrogate for stream power [drainage area * channel gradient] and the amount of road fill excavated from the stream crossing during treatment) were significant in the best fit model for post-treatment erosion.

Almost 80% of the treated road reaches had no detectible erosion following a 12-year recurrence interval storm. Even though most treatment sites were heavily vegetated within a few years of treatment, road fill failures still occurred on 20% of the road reaches. Hillslope position was an important variable in explaining post-treatment erosion of road reaches. Road reaches that exhibited erosional problems were most commonly found on steep, lower hillslopes and both minimal (ripping and draining) and more intensive (export outslipping) road treatments on lower hillslope roads resulted in high sediment yields to streams (660 m³/km of treated road). In contrast, on more gentle, upper hillslope positions, all treatment styles worked well and sediment delivery rates were only about 10 m³/km of treated road. By eliminating the risk of stream diversions and culvert failures, road treatments significantly reduce the long-term sediment risk from abandoned roads.

Adaptive land management involves monitoring the effects of management activities, and modifying land management approaches and techniques based on what is found to be effective. The results of this study can be used in an adaptive management strategy to guide future road removal work in the most cost-effective manner. The assessment presented here can also serve as a framework for evaluating the success of other restoration programs. Although erosion rates measured in this study are specific to the site conditions of the Redwood Creek catchment, this approach can be adapted to other regions. Accelerated erosion rates are a widespread problem in many regions of the world, and road treatments can be effective in significantly reducing sediment yields from abandoned roads.

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List of Figures

Figure 1. Location map of the Redwood Creek basin showing the distribution of roads in 1978 and 1992. Since 1978, about 300 km of road have been removed from the downstream third of the basin, which is managed by federal and state parks. The upstream two-thirds of the basin is privately owned and timber harvest is the primary land use.

Figure 2. Typical stream channel excavation. a) Abandoned logging road with intact culvert before treatment. b) Immediately following stream crossing excavation. In this case, rock armor and check dams were installed on the channel bed to prevent downcutting. c) Less than one year later, revegetation of the streambanks is well underway. d) Three years after treatment, alders have revegetated most of the ground disturbed during treatment.

Figure 3. Schematic diagram showing the ‘anatomy’ of a road bench and various road treatment techniques. a) Intact road bench with rockered surface and inboard ditch. b) The road is ripped and drained, so the rockered surface is disaggregated and the function of the inboard ditch is eliminated. c) Partial outslope, in which the steepest sidecast fill is placed at the toe of the cutbank. d) Total outslope, in which all sidecast fill is placed at the toe of the cutbank. e) Export outslope, where all the sidecast fill is removed from the road bench entirely.

Figure 4. An example of the least intensive road rehabilitation technique. a) Abandoned logging road before treatment. b) The road surface is decompacted, and ditches are constructed perpendicular to the road alignment to drain the road. The road bench and road fill remain in place.

Figure 5. An example of the most intensive road rehabilitation technique. a) Abandoned logging road before treatment. b) The road bench is obliterated and the hillslope is recontoured (total outslipping of the road bench, and total excavation of the stream channel). Stumps uncovered during excavation indicate the location and elevation of the original hillslopes.

Figure 6a. Cumulative length of sampled roads by date and method of treatment.
6b Cumulative length of sampled roads by date and hillslope position.

Figure 7a. Cumulative plot of total erosion from excavated stream crossings. Twenty percent of the crossings accounted for 73% of the total erosion.

7b. Cumulative plot of total erosion from treated road reaches. Twenty percent of the treated road length accounted for 99% of the total erosion.

Pacific Ocean

A

Redwood Creek
at Orick

Pacific Ocean

B

**Roads
in the
Redwood
Creek
Basin**

Redwood National
and
State Parks

Park Boundary

Garrett Creek

Lacks Creek

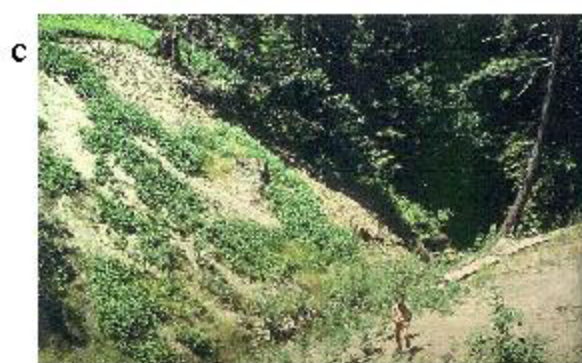
Redwood Creek
near Blue Lake

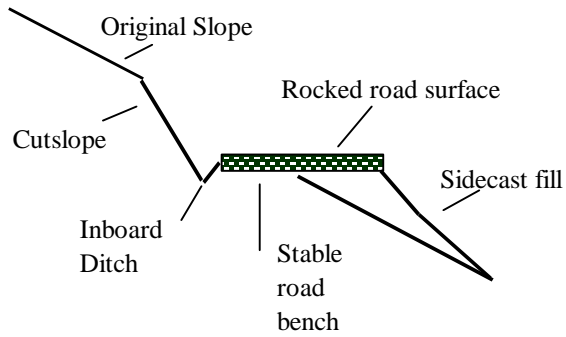


0 5 10 15 20
Kilometers

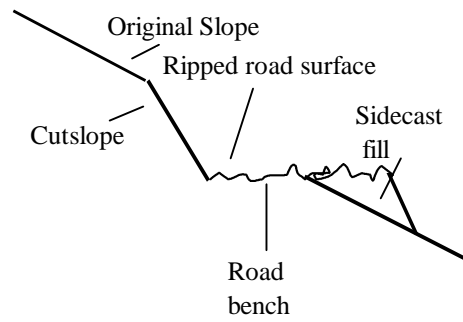
1978

1992

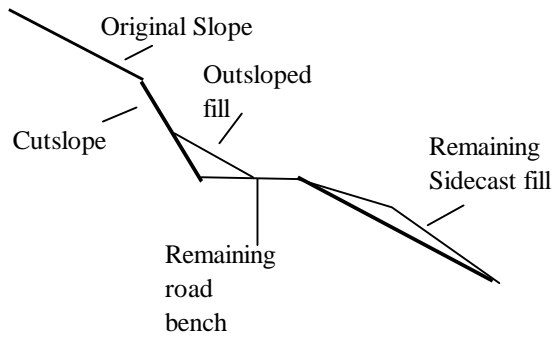




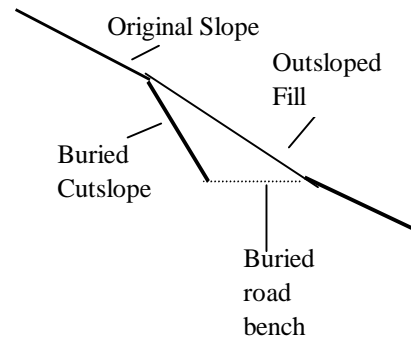
a Intact Road



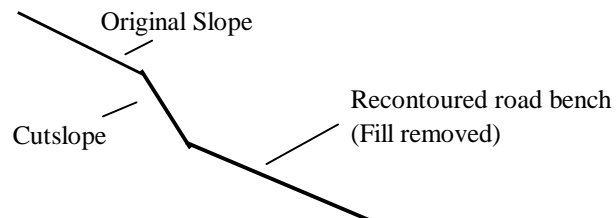
b Ripped and Drained



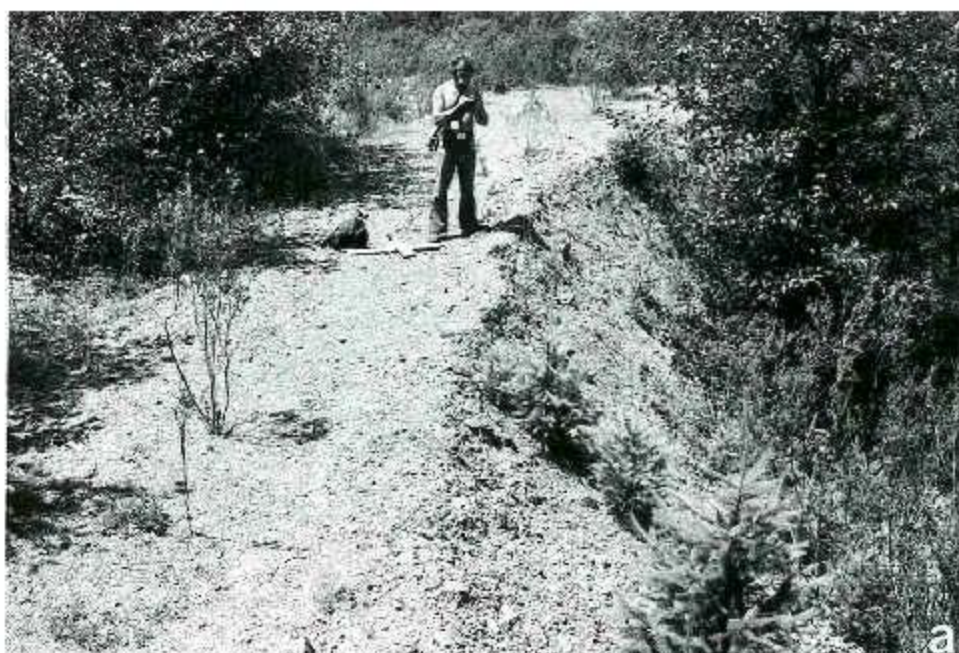
c Partial Outslope



d Total Outslope



e Export Outslope



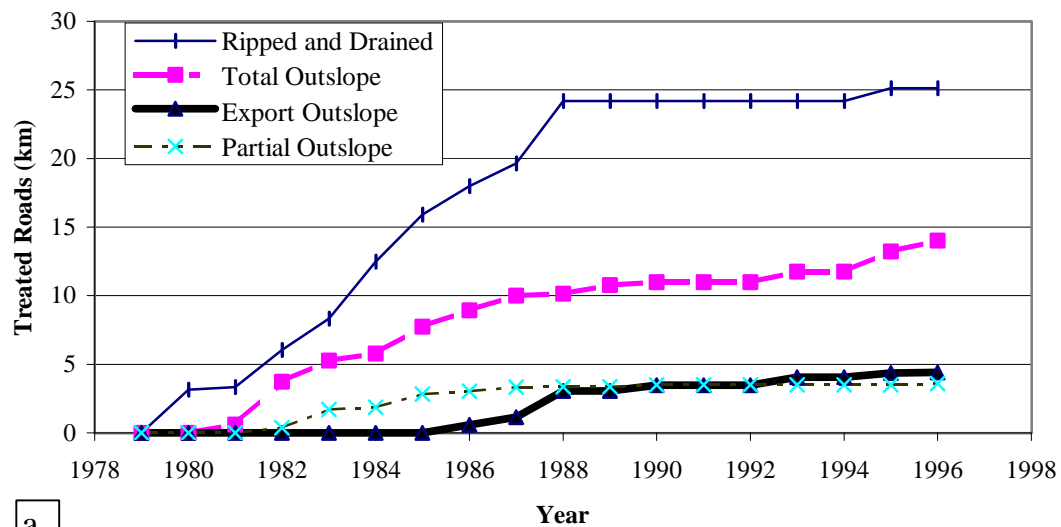


a



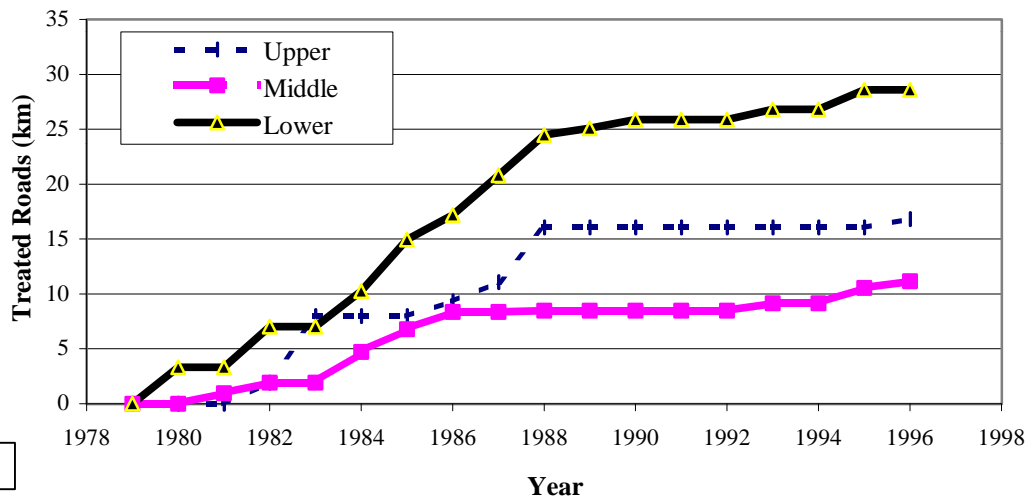
b

Cumulative Length of Road Treated by Date and Method



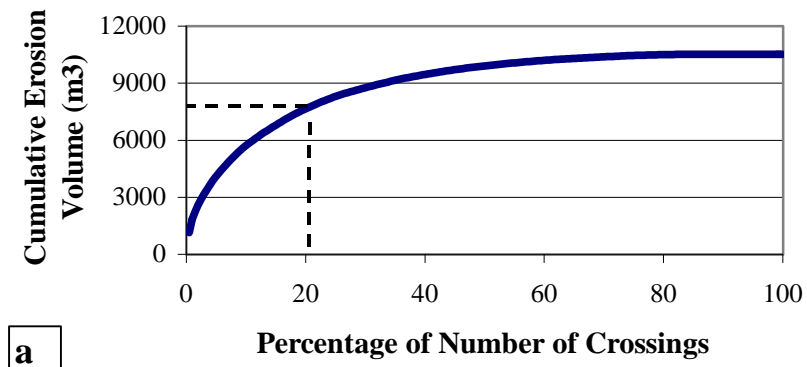
a

Cumulative Length of Road Treated by Date and Hillslope Position



b

Cumulative Erosion Volumes from Crossings



Cumulative Erosion Volume from Road Reaches

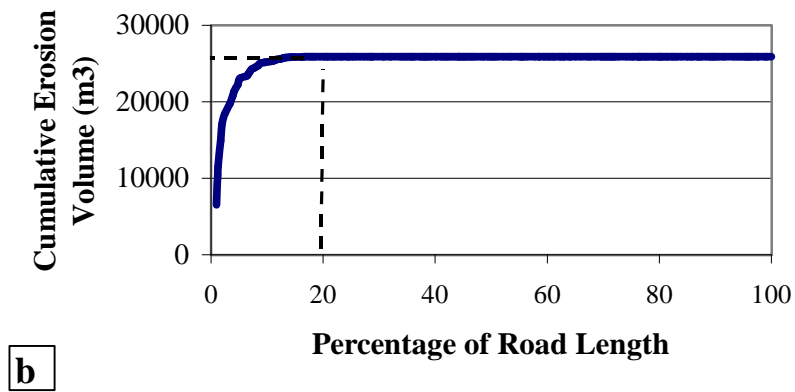


Figure 7